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THE COMMONWEALTH OF PENNSYLVANIA.

AGRICULTURE OF PENNSYLVANIA,

CONTAINING

REPORTS

OF THE

STATE BOARD OF AGRICULTURE,

THE

STATE AGRICULTURAL SOCIETY, THE STATE DAIRYMEN'S ASSOCIATION, THE STATE HORTICULTURAL ASSOCIATION, AND THE STATE COLLEGE,

FOR 1894.

CLARENCE M. BUSCH,
STATE PRINTER OF PENNSYLVANIA.
1894.

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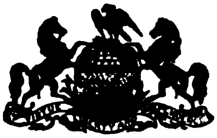

OBITUARY.

F. M. McKEEHAN.

Born October 20th, 1833.

Died March 25th, 1894.

Capt. F. M. McKeehan, late member of the Board from Perry County, was born near New Bloomfield, Perry County, Pa., October 20th, 1833, and died at his home, near Ferguson, in the same county, March 25th, 1894.

He was mustered into service in defense of the Union, September 2d, 1864, as Captain of Company E, of the 208th Regiment of Pennsylvania Volunteers. At the battle of Fort Steadman, he received the thanks of General Hartranft for bravery, and was noted for heroic conduct at the battle before Petersburg.

He represented his county for several terms in the Board of Agriculture, and at the time of his death, had but recently been re-elected for another term of three years.

One who knew him well bears testimony to his character, as follows:

"Wherever placed, his striking personality was impressed upon all the surroundings. For sterling, unswerving character, he was unsurpassed. Positive in conviction and fearless in opposition when he believed that he was right, he commanded universal respect, even with those who might be opposed to his views. A most fitting epitaph, applicable to any station in life which he may have been called on to fill, is, "Faithful to the end."

ISRAEL GARRETSON.

Born July 25th, 1830.

Died October 13th, 1894.

Israel Garretson, late member of the Board of Agriculture from Adams County, was born July 25th, 1830, in York County, Pennsylvania, and during his early life and until the year 1868, taught school; during the latter year he purchased a farm in Butler Township, Adams County, upon which he resided until the time of his death.

He organized and was the main supporter of the Adams County Agricultural Society, and was, in 1882, elected its representative in the State Board of Agriculture, a position which he retained until his death, having been elected January 24th, 1894, for another term of three years.

He was always prominent in the work of organizing and carrying on the Farmers' Institutes of his county, and his accounts for these expenditures were models of exact and careful account-keeping. He was also prominent as a judge of live stock, and his extensive knowledge of horses always rendered him a desirable judge at exhibitions.

In his association with his fellow members, Mr. Garretson was noted for his unassuming manners, his quiet and unobtrusive attitude, and his faithful adherence to what he believed to be for the best interests of the Board of Agriculture; and, probably, no member was more prominent in his regular attendance at its meetings, and in his faithful performance of the duties entrusted to him by his fellow members.

He was a prominent member of the Society of Friends, an exemplary citizen, and a man of influence in the community in which he resided.

OFFICIAL DOCUMENT, No. 7.

EIGHTEENTH ANNUAL REPORT

OF THE

Pennsylvania State Board of Agriculture.

FOR THE YEAR 1894.

MEMBERS EX-OFFICIO.

Hon. R. E. Pattison, *Governor.*
Hon. T. J. Stewart, *Secretary of Internal Affairs.*
Dr. N. C. Schaeffer, *Superintendent of Public Instruction.*
Gen. D. McM. Gregg, *Auditor General.*
Dr. G. W. Atherton, *President Pennsylvania State College.*
Thos. J. Edge, *Secretary State Board of Agriculture.*

APPOINTED BY THE GOVERNOR.

	Term expires.
Hon. S. R. Downing, Goshenville, Chester county,	1895
Hon. Will B. Powell, Shadeland, Crawford county,	1896
Col. James Young, Middletown, Dauphin county,	1897

ELECTED BY COUNTY AGRICULTURAL SOCIETIES.

			Term expires.
Adams,	*I. Garretson,	Biglerville,	1897
Allegheny,	W. H. McCullough,	Tarentum,	1897
Armstrong,	D. W. Lawson,	Dayton,	1896
Beaver,	E. S. Weyand,	Beaver,	1896
Bedford,	S. S. Diehl,	Bedford,	1897
Berks,	G. D. Stitzel,	Reading,	1895
Bradford,	Louis Piollet,	Wysox,	1895
Blair,	Fred'k Jaekel,	Hollidaysburg,	1895
Bucks,	E. Reeder,	New Hope,	1896
Butler,	W. H. H. Riddle,	Butler,	1896
Cambria,	J. J. Thomas,	Carrolltown,	1895
Cameron,	E. N. Fairchild,	Sizerville,	1897
Centre,	John A. Woodward,	Howard,	1897
Chester,	Dr. J. P. Edge,	Downingtown,	1896

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*Died, October 13, 1894.

			Term Expires.
Clarion,	W. Shanafelt,	Brinkerton,	1895
Clearfield,	J. Blair Read,	Clearfield,	1897
Clinton,	J. A. Herr,	Cedar Springs,	1896
Columbia,	Chandlee Eves,	Millville,	1897
Crawford,	Luther Gates,	Beaver Centre,	1895
Cumberland,	Charles H. Mullin,	Mt. Holly Springs,	1897
Dauphin,	G. Hiester,	Harrisburg,	1897
Erie,	A. L. Wales,	Corry,	1895
Fayette,	G. Hopwood,	Uniontown,	1897
Franklin,	D. Z. Shook,	Greencastle,	1896
Fulton,	D. H. Patterson,	Webster Mills,	1895
Greene,	B. F. Herrington,	Waynesburg,	1895
Huntingdon	G. G. Hutchison,	Warrior's Mark,	1897
Indiana,	N. Seanor,	Plumville,	1895
Jefferson,	J. McCracken, Jr.,	Frostburg,	1896
Juniata,	Matthew Rodgers,	Mexico,	1897
Lackawanna,	A. C. Sisson,	La Plume,	1897
Lancaster,	C. Cooper,	Bird-in-Hand,	1895
Lawrence,	J. B. Johnston,	New Wilmington,	1897
Lebanon,	C. R. Lantz,	Lebanon,	1894
Lehigh,	J. P. Barnes,	Allentown,	1897
Luzerne,	W. P. Kirkendall,	Dallas,	1896
Lycoming,	A. Fague,	Picture Rocks,	1897
McKean,	A. P. White,	Port Allegany	1897
Mercer,	Robert McKee,	Mercer,	1896
Mifflin,	*J. B. Shannon,	Lewistown,	1895
Mifflin,	M. M. Naginey,	Milroy,	1895
Monroe,	Randall Bisbing,	Minsi,	1896
Montgomery,	Jason Sexton,	Springhouse,	1896
Montour,	T. L. Clapp,	Limestoneville,	1895
Northampton,	B. B. McClure,	Bath,	1897
Northumberland,	John Hoffa,	Milton,	1896
Perry,	†F. M. McKeehan,	Ferguson,	1897
Perry,	D. Kistler,	Kistler,	1895
Potter,	W. A. Gardner,	Andrew's Settlement,	1897
Schuylkill,	W. H. Stout,	Pine Grove,	1897
Snyder,	E. W. Tool,	Freeburg,	1897
Somerset,	N. B. Critchfield,	Jenner's X Roads,	1895
Sullivan,	D. T. Huckell,	Forksville,	1897
Susquehanna,	R. S. Searle,	Montrose,	1895
Tioga,	P. D. Rexford,	Mansfield,	1896
Union,	J. A. Gundy,	Lewisburg,	1896
Venango,	Porter Phipps,	Kennerdell,	1895
Warren,	Charles Lott,	Warren,	1895
Washington,	John McDowell,	Washington,	1896
Wayne,	N. F. Underwood,	Lake Como,	1895
Westmoreland,	W. C. Sloan,	Sloan,	1895
Wyoming,	N. G. Bunnell,	Vosburg,	1894
York,	W. S. Roland,	York,	1895

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* Resigned. † Died. March 25, 1894.

OFFICIAL LIST.

President.

Hon. Robert E. Pattison, *Governor.*

Vice Presidents.

Dr. John P. Edge,
N. B. Critchfield,
James McCracken, Jr.

Executive Committee.

Hon. R. E. Pattison,
Geo. Hopwood,
C. Cooper,
B. B. McClure,
J. McDowell,
Joel A. Herr.
G. Hiester,
W. C. Sloan,
Thomas J. Edge, *Secretary.*

Advisory Committee.

C. Cooper,
Joel A. Herr,
G. Hiester.
Thomas J. Edge, *Secretary.*

Secretary.

Thomas J. Edge, Harrisburg.

Botanist.

Thos. Meehan, Germantown.

Pomologist.

Cyrus T. Fox, Reading.

Chemist.

Dr. Wm. Frear, State College.

Veterinary Surgeon.

Dr. F. Bridge, Philadelphia.

Sanitarian.

Dr. G. G. Groff, Lewisburg.

Microscopists and Hygienists.

Dr. H. Leffmann, Philadelphia,
Prof. C. B. Cochran, West Chester.

Entomologists.

Prof. R. C. Schiedt, Lancaster,
Dr. H. Skinner, Philadelphia.

Ornithologist.

Dr. B. H. Warren, West Chester.

Small Fruit Culturist.

Prof. S. B. Heiges, Washington, D. C.

Meteorologists.

J. L. Heacock, Quakertown,
Maj. Frank Ridgway, Harrisburg.

Mineralogist.

Joseph Wilcox, Philadelphia.

Apiarist.

Dr. G. G. Groff, Lewisburg.

Geologist.

Prof. J. P. Lesley, Philadelphia.

Stenographer.

Joseph F. Cummings, Sunbury.

STANDING COMMITTEES—1894.

Legislation.

N. B. Critchfield, Chairman,
B. H. Warren,
D. H. Patterson.
J. J. Thomas,
J. A. Woodward,
E. W. Tool,
Frank N. Moore

Forests and Forestry.

Dr. W. S. Roland, Chairman,
Dr. J. T. Rothrock,
Prof. Thomas Meehan,
J. J. Thomas,
N. F. Underwood,
D. H. Patterson.
John McDowell,
Noah Seanor,

Cereals.

James McCracken, Jr., Chair'n,
David H. Branson,
J. B. Johnston,
P. D. Rexford,
J. Sexton,
G. G. Hutchison.
J. Blair Read,
Matthew Rodgers,

Wool and Textile Fibers.

John McDowell, Chairman,
Will B. Powell,
James Young,
J. A. Herr,
Chill Hazzard,
Thomas Dolan,
Theo. Justice,
S. B. Heiges,
James S. McKean,
A. C. Sisson.
Julius LeMoyne,
J. S. Buchanan,
W. W. Hunter,

Birds and Mammals.

Dr. B. H. Warren, Chairman,
N. B. Critchfield,
J. J. Thomas,
N. F. Underwood,
Abner Fague,
B. B. McClure.
Randall Bisbing

Apiary.

F. M. McKeehan, Chairman,
Dr. G G. Groff,
Calvin Cooper,
N. F. Underwood,
Geo. D. Stitzel,
I. Garretson,
John Hoffa,
N. B. Critchfield.
J. A. Gundy,
S. R. Downing
J. A. Herr,

Roads and Road Laws.

Samuel R. Downing, Chairman,
Calvin Cooper,
J. A. Gundy,
N. F. Underwood,
Dr. J. P. Barnes,
George Hopwood,
Joel A. Herr,
P. D. Rexford,
A. L. Wales,
B. B. McClure,
J. A. Woodward
J. Blair Read.

Fruit and Fruit Culture.

Geo. Hopwood, Chairman,
Cyrus T. Fox,
S. B. Heiges,
Calvin Cooper,
J. A. Herr,
H. C. Snavely,
Casper Hiller,
W. C. Sloan,
E. B. Engle,
Fred Jaekel,
J. E. Jamison
E. A. Brinser,
A. C. Sisson,
G. Hiester,
D. Z. Shook.

Ensilage and Fodder Crops.

A. L. Wales, Chairman,
Jason Sexton,
Louis Piolett.
G. Hiester,
B. B. McClure,
I. Garretson,
J. A. Gundy,

Poultry.

J. A. Gundy, Chairman,
George Corson,
H. L. Holmes,
J. T. Ailman.
John Hoffa,
Edward Hickman,
Mrs. E. S. Starr,
B. F. Herrington,
William E. Miller,
D. B. Esh,

SYNOPSIS OF THE MINUTES OF THE MEETINGS OF THE BOARD.*

ANNUAL MEETING.

Held at Harrisburg, Pennsylvania, January 24th and 25th, 1894.

Wednesday, January 24, 1894.

Board called to order at 9.30 a. m., by Governor R. E. Pattison in the Chair.

Present during the sessions: Hon. R. E. Pattison, Gen'l D. McM. Gregg, Dr. N. C. Schaeffer and Messrs. Young, Downing, Powell, Dr. Edge, Garretson, McCullough, Lawson, Stitzel, Piolett, Reeder, Riddle, Thomas, Woodward, Shanafelt, Read, Herr, Eves, Mullin, Hiester, Wales, Hopwood, Herrington, Hutchison, Seanor, McCracken, Rodgers, Sisson, Cooper, Johnston, Barnes, Kirdendall, Fague, McKee, Shannon, Bisbing, Sexton, Clapp McClure, Hoffa, McKeehan, Critchfield, Huckell, Searle, Rexford, Gundy, Phipps, Lott, McDowell, Underwood, Sloan, Tool, Roland and Secretary.

The Chair named Messrs. Roland, McDowell and Gundy as a committee on credentials.

Report of Secretary read, and discussed by Messrs. Cooper, McCracken, Lawson, Hopwood, Sloan, and its recommendations referred to the Executive Committee for action and report.

The committee on credentials reported that the following gentlemen had presented certificates of election, and were entitled to seats as members of the Board from their respective districts: J. P. Barnes of Lehigh, W. H. H. Riddle of Butler, F. M. McKeehan of Perry, G. G. Hutchinson of Huntingdon, G. Hopwood of Fayette, J. B. Johnston of Lawrence, A Fague of Lycoming, Chandlee Eves of Columbia, I. Garretson of Adams, W. H. McCullough of Allegheny, J. B. Read of Clearfield, G. Hiester of Dauphin, J. A. Woodward of Centre, M. Rodgers of Juniata, D. T. Huckell of Sullivan, and A. C. Sisson of Lackawanna.

The committee on credentials also reported that the following delegates were present with proper credentials: D. H. Branson, State Agricultural Society; A. J. Kahler, Muncy Valley Farmers' Club; J. O. Warner and A. M. Yost, Columbia County Agricultural Society; Dr. S. P. Heilman, Mt. Gretna Farmers' Association; P. Taylor and S. Beam, Adams County Agricultural Society; G. Y. Graham, H. Hartzler and J. Groninger, Juniata County Agricultural Society; C. T. Fox, H. M. Engle, S. B. Heiges, H. C. Snavely, T. A. Woods, W. W. Comfort, and E. B. Engle, State Horticultural Association; H. M. Mayer, H. M. Engle and F. R. Diffenderfer, Lancaster County Agricultural Society; C. T. Fox, James McGowan and M. N. Ritter, Berks County Agricultural Society; J. A. Bower and J. E. Stephens, Perry County Agricultural Society; Hon. E. M. Tewksbury, Grange No. 216, of Columbia County, and W. A. Kendall, Big Cove Agricultural Society.

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*The limited space at the disposal of the Board and the large amount of matter available, prevents us from giving more than a brief synopsis of the proceedings, and it is but just to state that the work shown by the minutes is but a small portion of that accomplished during the year.—SECRETARY.

The Chair named Messrs. Shannon, McCracken and Underwood, as tellers, and directed that the election for officers was next in order.

Messrs. McCracken, Lawson, Critchfield, McKeehan, McDowell, Roland, Searle and Dr. Edge were nominated as Vice Presidents, three to be elected. After the first ballot, the tellers announced that Dr. Edge and Critchfield were elected, when, on motion of Mr. Herr, the Secretary was directed to cast the ballot of the Board for Mr. McCracken, as Vice President, he having the highest number of votes of those not elected.

Messrs. Sloan, Cooper, Seanor, Hiester, Eves, Herr, McClure, Hopwood, Shanafelt, McDowell, Garretson and Riddle were nominated as members of the Executive Committee, seven to be elected.

On motion of Mr. Herr, it was decided not to read the reports of the Standing Committees, the same having already been printed in the annual report for 1893.

On motion, the reading of the minutes of the preceding meeting was dispensed with, they being printed in the annual report of 1893.

Eastburn Reeder, State Dairy Commissioner, read his annual report, when, on motion, its discussion was postponed until the opening of the afternoon session.

The tellers reported that Messrs. Cooper, Hiester, McClure and Sloan had been elected members of the Executive Committee by the first ballot.

The Chair then directed that another ballot should be taken for the remaining three members of the Executive Committee.

At the close of the ballot, adjourned to meet at 2 p. m.

Wednesday Afternoon, January 24, 1894.

Board called to order at 2 p. m., by Governor R. E. Pattison, in the Chair.

The tellers reported that by the second ballot, Messrs. McDowell, Herr and Hopwood had been elected members of the Executive Committee.

Mr. Searle nominated Thomas J. Edge, for the position of Secretary, when, on motion of Mr. Herr, the nominations were closed, and Mr. Searle was directed to cast the ballot of the Board for Thomas J. Edge, for the position of Secretary.

H. M. Engle presented a request from the State Horticultural Association, that the Board would include in its next appropriation bill, an item for the benefit of the State Horticultural Association. After an explanation by Mr. Fox, and on motion, the request was referred to the Committee on Legislation for examination and report.

Dr. Henry Leffmann, Microscopist of the Board, then read an essay on "Milk Inspection and Milk Standards," when, by decision of the Chair, the questions of Milk Inspection and Milk Solids were declared open for general discussion, which was participated in by Dr. Lee, Secretary State Board of Health; Eastburn Reeder, Dairy Commissioner; Geo. Abbott, Capt. A. A. Slack, Dr. Leffmann, Prof. C. B. Cochran and others.

On motion adjourned until 7.30 p. m.

Wednesday Evening, January 24th, 1894.

Board called to order at 7.30 p. m., by Governor R. E. Pattison, in the Chair.

Dr. J. T. Rothrock, State Forestry Commissioner, delivered an illustrated lecture on "The Present Relation of Forestry to the State," which was listened to by a large and appreciative audience.

On motion, adjourned until 9.30 a. m., Thursday, January 25th.

Thursday Morning, January 25th, 1894.

Board called to order at 9.30 a. m., by Governor R. E. Pattison in the Chair.

Mr. Cooper, on behalf of the Executive Committee, reported that they had confirmed the following nominations for Honorary officers made by the Secretary:

Botanist, Thomas Meehan, Philadelphia; Chemist, Dr. William Frear, State College; Pomologist, Cyrus T. Fox, Reading; Veterinary Surgeon, Dr. F. Bridge, Philadelphia; Sanitarian, Dr. G. G. Groff, Lewisburg; Microscopists and Hygienists, Dr. H. Leffman, Philadelphia, and Prof. C. B. Cochran, West Chester; Entomologists, Prof. R. C. Schiedt, Lancaster, and Dr. H. Skinner, Philadelphia; Ornithologist, Dr. B. H. Warren, West Chester; Small Fruit Culturist, Prof. S. B. Heiges, York; Meteorologists, J. L. Heacock, Esq., Quakertown, Maj. Frank Ridgway, Harrisburg; Mineralogist, J. Wilcox, Philadelphia; Geologist, Prof. J. P. Lesley, Philadelphia, and Stenographer, J. F. Cummings, Sunbury.

The Executive Committee also reported that they had elected Messrs. Cooper, Hiester and Herr, as members of the Advisory Committee, and that the following had been appointed chairmen of their respective Standing Committees: Legislation, Hon. N. B. Critchfield; Forests and Forestry, Dr. W. S. Roland; Cereal Crops, J. McCracken; Birds and Mammals, Dr. B. H. Warren; Fruit and Fruit Culture, G. Hopwood; Apiary, F. M. McKeehan; Wool and Textile Fibers, J. McDowell; Ensilage and Fodder Crops, A. L. Wales; Roads and Road Laws, S. R. Downing; and on Poultry, J. A. Gundy.

Hon. J. A. Woodward offered the following resolutions:

"Whereas, The Secretary of Agriculture has omitted from his estimates for the ensuing year, the appropriation for the Agricultural Experiment Stations of the United States, which has heretofore formed a regular item of the agricultural appropriation bill, on the ground that said appropriation is not, as the law now stands, a legitimate charge against the Department of Agriculture; therefore,

Resolved, That we regard the work of the Agricultural Experiment Stations, and that of the Pennsylvania Station in particular, as one of very great economic and practical value to the farmers of the State and of the United States, and that we hereby request our Representatives in Congress to use their best efforts to secure the continuance of the appropriations for its support in such form as may be necessary to insure that the money shall be faithfully and honestly expended for the purposes designated in the Hatch Act.

Resolved, That we would welcome an impartial and thorough investigation, by competent authority, into the management of any and all Stations, to the end that any abuses, if such exist, may be exposed and corrected.

Resolved, That copies of these resolutions be sent to the Senators and Representatives from this State, to the Secretary of Agriculture, and to the Director of Agricultural Experiment Stations."

They were adopted, and the Secretary was directed to furnish copies to our representatives in Congress.

Dr. John P. Edge offered the following resolution, which was adopted: "Resolved, That the Committee on Legislation be instructed to revise the rules and regulations upon which the membership of this Board is based, and report at the next meeting such changes in the said law or rules as they may deem necessary, and also what legislation is required to define the rights of membership."

On motion, the Board then proceeded to fix the time and place of the next meeting, when, on behalf of the Executive Committee, Mr. Cooper announced that that committee had decided to recommend the omission of the spring meeting for the present year; report of the Executive Committee adopted and the Board proceeded to fix the place for the autumn meeting; Mr. Critchfield named Somerset; Mr. Stitzel named Kutztown; Mr. Herr named State College, and Mr. Kirkendall named Dallas. After a call of the roll, the tellers announced that State College had been selected as the place of the autumn meeting.

Henry Comfort, acting for the Guernsey Cattle Breeders' Association, presented a resolution requesting the State Board of Agriculture to present to the Legislature an Act for the eradication of tuberculosis, basing its provisions upon those adopted for the suppression of contagious pleuro-pneumonia, which was, after discussion, referred to the Committee on Legislation, with instructions to present a draft of the proposed Act at the next meeting of the Board.

J. A. Gundy, member from Union, then read an essay on "Substitutes," illustrating it by specimens of imitation butter, imitation coffee and imitation eggs.

That portion of Mr. Gundy's essay relating to the manufacture and sale of oleomargarine or imitation butter, was discussed by Messrs. Piolett Cassell, Gundy, Reeder, Nesbit, Woodward, Herr, Powell Sloan, Searle, Branson and Heiges.

After a protracted discussion, Mr. Sloan moved that the Committee on Legislation be instructed to report a restrictive act to take the place of the present one, which was prohibitory. Dr. Edge moved that the session be extended for a half hour in order that the question might be disposed of, but afterwards withdrew the resolution.

On motion, the whole question was postponed until the next meeting, and an adjournment was ordered pending the discussion of Mr. Sloan's motion to request the Legislative Committee to present a restrictive act.

Thursday Afternoon, January 25th, 1894.

Called to order at 2 p. m., by Hon. R. E. Pattison, in the Chair.

Hon. Alfred S. Bolles, Chief of the Bureau of Industrial Statistics, delivered an address upon "The Causes of the Decline in the Prices of Agricultural Products."

Dr. N. C. Schaeffer, Superintendent of Public Instruction, delivered an address on "The Education of Farmers' Sons and Daughters," the subject matter of which was discussed by Messrs. Lawson, Tewksbury, Hopwood, Dr. Edge, Downing, Schaeffer and Critchfield.

Prof. S. B. Heiges, of the National Department of Pomology, delivered an address on "The Farmers' Invisible Friends and Foes."

On motion adjourned until 7.30 p. m.

Thursday Evening, January 25th, 1894.

Board called to order at 7.30 p. m., by Hon. N. B. Critchfield, Vice President, in the Chair.

W. L. Nesbit read an essay on "The Maize Plant, and its Relation to Past and Present Agricultural Conditions."

Dr. B. H. Warren, Ornithologist of the Board, delivered an illustrated lecture on the "Furred and Feathered Friends and Foes of the Farmer," which was listened to by a large audience.

On motion, adjourned to meet at the call of the Advisory Committee.

SUMMER MEETING.

Held at Somerset, Pa., June 6th and 7th, 1894.

Board called to order at 10 a. m., by Hon. R. E. Pattison in the Chair.

Present, Hon. R. E. Pattison and Messrs. Downing, Powell, Young, Garretson, McCullough, Lawson, Diehl, Stitzel, Piollet, Jaekel, Reeder, Riddle, Thomas, Dr. Edge, Shanafelt, Read, Herr, Eves, Gates, Hopwood, Patterson, Herrington, Hutchison, Seanor, Rodgers, Sisson, Cooper, Johnston, Barnes, Fague, McKee, Sexton, Clapp, McClure, Hoffa, Kistler, Tool, Critchfield, Huckell, Searle, Gundy, Lott, McDowell, Underwood, Sloan, Gardner, and Secretary. Drs. Rothrock and Warren of the Honorary Officers were also present.

On behalf of the citizens of Somerset and Somerset county, General W. H. Koontz delivered an address of welcome, which was replied to on behalf of the Board, by Hon. R. E. Pattison.

The Chair named Messrs. McDowell, Barnes and Hopwood a committee to receive and report upon the credentials of members-elect and delegates.

On motion, B. B. McClure, member from Northampton, read a paper on "Stray Thoughts," the subject matter of which was discussed by Messrs. Lawson, McWilliams, Tewksbury, Critchfield, Piollet, Garretson and others.

The committee on credentials reported that from the credentials in their possession, they found that M. M. Naginey had been elected from Mifflin county, in the place of J. B. Shannon, resigned; that D. Kistler had been elected for the term of one year from Perry county, in the place of F. M. McKeehan, deceased, and that W. A. Gardner had been elected from Potter county.

They also reported that the following delegates were present with proper credentials:

J. B. Phelps, Pennsylvania State Dairymen's Association; W. A. Gardner, Potter County Farmer's and Breeders' Association; F. S. Shoop, J. C. Walters and W. M. Crosby, Armstrong County Pomona Grange; F. N. Moore, S. W. Lester and Levi Wells, Farmers' Institute of Bradford county; John I. Carter and August Brosius, London Grove Grange, No. 63, of Chester county; E. M. Tewksbury, Pomona Granges of Columbia, Union, Perry, Warren, Berks and Tioga counties; D. B. McWilliams, Pomona Grange of Juniata county; Peter Dumbald, Milford Grange; Thos. B. Hunter, Blair County Pomona Grange; Alexander Strittmatter, Farmer's Alliance of Cambria county; J. G. McSparran, Fulton Grange, No. 66 of Lancaster county; S. J. Eckman, Valley Grange, No. 52, of Columbia county; S. R. Downing and Dr. B. H. Warren, Goshen Grange, No. 121, of Chester county; F. P. Saylor, Somerset County Grange; D. H. Watts and A. J. Smith, Clearfield County Agricultural Society and P. K. Moore, Grange No. 934.

On motion, the report of the committe was adopted, and the members and delegates admitted to seats under the rules.

On motion of R. S. Searle, all the delegates from granges, alliances and other organizations present, but without credentials, were given the rights of delegates.

On motion of Dr. John P. Edge, the following was adopted:

"Resolved, That the Secretary of the Board be instructed to apply to the Commissioners of Public Buildings and Grounds, at Harrisburg, for the assignment to the use of the Board of Agriculture, for all the volumes of the Agriculture of Pennsylvania, for 1893, uncalled for in the storage rooms of the Capital Buildings."

On motion, J. F. Cummings, stenographer of the Board, read an essay on "Weeds and Weeding," which elicited discussion from Messrs. Lawson, Cummings, Eves, Garretson and others.

On motion, adjourned until 2 p. m.

Wednesday Afternoon, June 6, 1894.

Board called to order at 2 p. m., by Hon. R. E. Pattison, in the chair.

Governor Pattison stated that the business of the session was the discussion of the resolution of Mr. Sloan, as offered at the annual meeting, requesting the Committee on Legislation to prepare and present a draft of a restrictive act to take the place of the present law prohibiting the manufacture and sale of oleomargarine in the State.

After discussion by Messrs, Riddle, Piollet, Thomas, Critchfield, Lawson, Tewksbury, Sloan, Secretary and others, it was, on motion of Mr. Piollet, resolved that all speeches be limited to ten minutes each, except by special consent of the Board, and that no person speak a second time until all had an opportunity to be heard.

It was resolved that the roll of counties be called, and that, as each county was called, the member of the Board and all delegates present from the county should respond, subject to the ten minute rule.

After a partial discussion, it was resolved, on motion of Mr. Searle, that the time of adjournment be extended one hour in order that the matter might be disposed of.

The hour of six o'clock having arrived, it was resolved, on motion of Mr. Piollet, seconded by Mr. Critchfield, that one hour of the evening session be devoted to the final discussion of the question.

On motion, adjourned until 7.30 p. m.

Wednesday Evening, June 6, 1894.

Board called to order at 7.30 p. m., by Governor R. E. Pattison in the chair.

Discussion of Mr. Sloan's motion relative to a restrictive act regulating the sale of oleomargarine, resumed and completed.

On motion, the roll of members was then called, when the vote showed that sixteen members were in favor of the resolution, and twenty-eight opposed to it, and the resolution was therefore declared lost.

During the discussion of the subject, resolutions opposing any change in the present oleomargarine law, were presented from the following organizations:

Indiana County Pomona Grange, No. 12; Perry County Pomona Grange, No. 47; Montgomery County Pomona Grange, No. 8; Washington Grange, No. 925, of Berks county; Pomona Grange of Columbia and Lower Luzerne counties; Pomona Grange, No. 24, of Bedford county; Farmington Grange, No. 839, of Warren county; Pomona Grange, No. 46, of Union county; Highland Grange, No. 879; Spring Creek Grange, No. 236, of Erie county; Fidelity Grange, No. 1067, of Westmoreland county; Bell Point Grange, No. 806; Solebury Farmers' Club, of Bucks county; Horsham Farmers' Club of Montgomery county. There were also resolutions presented by delegates who failed to furnish the Secretary with a copy thereof.

Dr. J. T. Rothrock, State Forestry Commissioner, delivered an illustrated lecture on "Forestry," which was listened to by an appreciative audience filling the court room.

On motion, adjourned until 9.30 a. m., Thursday.

Thursday Morning, June 7, 1894.

Board called to order at 9 a. m., by Governor R. E. Pattison in the chair.

On behalf the Committee on Legislation, Hon. N. B. Critchfield presented the following report:

"The Committee on Legislation would respectfully submit the following report:

But three questions were submitted to your committee at the last meeting:

1st. The following resolution was adopted and referred: "Resolved, that the Committee on Legislation be instructed to revise the rules and regulations under which the membership of this Board is based, and report at the next meeting such changes in the said laws or rules as they may deem necesary, to define the rights of membership."

Your committee have had no opportunity of coming together for the purpose of considering this resolution until the present meeting convened, and as the subject is one of very great importance, involving the possibility of an entire change of the basis upon which the Board is organized, we do not feel that it would be proper to attempt to frame a final report without having more time for consideration of the subject, and giving the members of the Board an opportunity to express their views upon it. Upon this resolution, your committee, therefore, reports progress, and pending their final report, request that members of the Board who consider that either the rules of the Board or the Act of Assembly creating the body should be amended, shall write to the chairman, indicating the amendments, which, in their judgment, should be made.

2d. A resolution from the Guernsey Cattle Breeders' Asociation requesting that the Board should present an act to the Legislature providing for the eradication of tuberculosis among cattle, was also referred to the committee, and upon this subject we beg leave to report that such a bill was offered in the Senate by the Chairman of your committee at the last session of the Legislature, and passed the Senate without opposition, but, with much other legislation, was not reached on final passage by the House, and therefore did not become a law, although it met with no opposition in either house of the General Assembly; your committee would recommend that the same bill be presented at the next session of the Legislature.

3d. A request from the State Horticultural Association that the Board of Agriculture include in its next general appropriation bill an item for the benefit of the said association, was also referred to your committee.

With reference to this we report that, while this Board is in full sympathy with the State Horticultural Association and other kindred associations for the advancement of the various agricultural interests of the Commonwealth, we do not believe that it would be proper to include in the general appropriation for which we ask, items not intended to be expended in carrying on the work of this Board."

On motion, the report of the committee was adopted and ordered placed upon the minutes.

Dr. H. P. Armsby, Director of the State Experiment Station, invited the members of the Board to participate in the commencement ceremonies at the State College, June 10th to 13th, next, and on motion, the invitation was accepted.

W. H. McCullough, member from Allegheny, read an essay on "Heredity in Education," which called out discussion from a number of members and others.

S. S. Diehl, member from Bedford, read an essay on "Education."

Dr. John P. Edge, member from Chester, read an essay on "The Sanitary Effects of Forests."

Augustus Brosius, of London Grove, read an essay, on "The Past, Present and Future of Agriculture."

All essays called out discussion from those present.

On motion the chair named Messrs. Cooper, Herr and Dr. Edge as a committee on resolutions.

On motion, adjourned until 1.30 p. m.

Thursday Afternoon, June 7, 1894.

Board called to order at 2 p. m., by Governor R. E. Pattison in the chair.

On motion of the Secretary, questions from the question box were answered by Messrs. Kistler, Cooper, Cummings, Jaekel and others.

Calvin Cooper, member from Lancaster, read an essay "The Skeptical Farmer."

John I. Carter, of Chester county, read an essay on "Farming for a Purpose."

D. H. Patterson, member from Fulton, read an essay on "The Future Farmer."

The subject matter of the essays called out discussion from Messrs. Kistler, Garretson, Cooper, Cummings, Eves, McKee, Riddle, McCullough and others.

The committee on resolutions reported as follows:

"Whereas, The State Board of Agriculture now in session, having been the recipients of the kindest courtesy and most generous welcome by the people of this borough and county, we feel it a duty to express our appreciation and heartfelt gratitude for the cordial reception and the untiring attention extended to us during our stay among your people.

Therefore, Resolved, That we, the members of the State Board of Agriculture, unanimously extend to the citizens of Somerset and its vicinity, our hearty thanks:

To the committee of arrangements, for the very handsome reception given us on our arrival in your mountain town, where the pure air of this high altitude seems to have inspired your people to give us a royal welcome:

To. General W. H. Koontz, for his very eloquent and masterly address of welcome at the opening of the session:

To the Court officers and the Judges of the Court who considerately yielded the Court Room for our use, that the good light, excellent acoustics and ample accommodations would expedite our deliberations:

To Mr. W. H. Ruppel and his orchestra for their excellent music so eloquently rendered at the evening session:

To the Hon. N. B. Critchfield, the resident member of the Board, for his untiring energy in looking after our comfort while here:

And to the citizens of the borough and neighborhood, and especially to the ladies, for their kind presence and encouraging interest in our proceedings."

Signed, C. Cooper, J. A. Herr and Dr. J. P. Edge, Committee.

Report of Committee on Resolutions unanimously adopted, and ordered incorporated in the minutes.

On motion, adjourned to meet at the State College, in October, at the call of the Advisory Committee.

AUTUMN MEETING.

Held at State College, Penn'a, October 17th and 18th, 1894.

Board called to order at 9 a. m., October 17th, by Hon. R. E. Pattison in the chair.

Present: Hon. R. E. Pattison and Messrs. Atherton, Downing, Powell, McCullough, Lawson, Diehl, Jaekel, Reeder, Riddle, Thomas, Woodward, Dr. Edge, Shanafelt, Read, Herr Eves, Gates, Hiester, Wales, Shook, Patterson, Herrington, Seanor Rodgers, Sisson, Johnston, Barnes, Fague, McKee, Naginey, Bisbing, Sexton, Clapp, McClure, Hoffa, Kistler, Tool, Huckell, Searle, Gundy, Phipps, McDowell, Underwood, Sloan, White, Fairchilds, Stout and Secretary.

The chair named Messrs. Herr, Downing and Sexton a committee to receive the credentials, and report thereon to the meeting.

General James A. Beaver, on behalf of the Trustees of the State College, welcomed the Board.

Dr. G. W. Atherton, President of the State College, on behalf of the College and Faculty, also welcomed the Board.

Colonel J. A. Woodward, on behalf of the Centre County Agricultural Society, delivered an address of welcome, all of which were replied to on behalf of the Board, by Hon. R. E. Pattison, Governor and President of the Board.

The committee on credentials, through Mr. Herr, chairman, reported that they found that the McKean County Agricultural Society had elected A. P. White as a member of the Board for a term of three years; that the Cameron County Agricultural Society had elected E. N. Fairchilds as a member for the same term, and that the Schuylkill County Agricultural Society had elected W. H. Stout for a term of one year; the committee recommended that all should be received as members for the legal term of three years.

The committee further reported that the following delegates were present as the representatives of their respective organizations, with proper credentials.

Mrs. E. S. Starr, Pennsylvania Horticultural Society; W. C. Patterson and D. S. Fields, Big Cove Agricultural Society of Fulton county;

W. H. Dornblasser, Clinton County Agricultural Society; D. H. Watts, W. B. Stephenson and C. Mitchell, Agricultural Society of Clearfield county; W. H. Howard, Cameron County Alliance, No. 359; D. W. Cooper, Grange No. 194, Lackawanna county.

The committee also reported that they were informed that numerous other delegates, not having credentials, were present for the purpose of representing their respective organizations in the discussion of any topics which might come before the meeting.

On motion, the report of the committee was adopted, and Messrs. White, Fairchilds and Stout declared members of the Board for the term of three years, commencing January, 1894.

On motion of Mr. Gundy, seconded by Mr. Herr, it was decided to admit all delegates present, even though without credentials, to a representation.

The chair named Messrs. Cooper, Barnes, and Dr. Edge to prepare and submit to the Board proper resolutions relating to the death of Captain F. M. McKeehan, late member from Perry, and Israel Garretson, late member from Adams.

Dr. N. C. Schaeffer, Superintendent of Public Instruction, delivered an address on "The Pennsylvania State College and its Relation to the Public Schools of the State."

Calvin Cooper, member from Lancaster, read an essay on "Catch Crops," which elicited discussion from members and delegates.

On motion, adjourned until 1.30 p. m.

Wednesday Afternoon, October 17, 1894.

Board called to order at 1.30 p. m., by Hon. R. E. Pattison in the chair.

Dr. H. P. Armsby, Director of the Experiment Station, explained the work of the College and Station, and answered numerous inquiries relating to both institutions, and announced that cadets and guides were in readiness to escort the Board delegates over the College and Station Buildings, and the College and Station farms and experimental grounds.

On motion, adjourned for an inspection of the College, Station and farms, to meet at 7.30 p. m.

Wednesday Evening, October 17, 1894.

Board called to order at 7.30 p. m., by Hon. R. E. Pattison in the chair.

Dr. G. W. Atherton, President of the Pennsylvania State College, delivered an address in relation to "A System of Public Education for Pennsylvania."

Adjourned to meet at 9 a. m., Thursday, October 18, 1894.

Thursday Morning, October 18, 1894.

Board called to order at 9 a. m., by Hon. R. E. Pattison in the chair.

Committee on resolutions relating to the death of Captain F. M. McKeehan and Israel Garretson, through Mr. Cooper, chairman, reported as follows:

"Whereas, This Board having lost by death, two of its highly esteemed members, F. M. McKeehan, late member from Perry county, and Israel Garretson, late member from Adams county, it becomes our duty to express our sorrowing regrets:

Therefore, Resolved, That in the death of F. M. McKeehan, which occurred March 25, 1894, the Board has lost an intelligent and sincere member, who, by his character as a modest man and earnest in the work of the Board, had won the respect and esteem of its members.

Resolved, further, That in the death of Israel Garretson, on the 13th day of October, 1894, the Board has lost a valuable member, who, during his long connection with this body, by his faithful and conscientious services in the furtherance of its best interests, had endeared himself in the hearts of the members with whom he had associated, and in his absence, his surviving associates should cherish his memory.

Resolved further, That we, as members of the Board, condole with the families of the deceased, and extend to them our sincere sympathy in their bereavement, and request that these resolutions be recorded on the minutes of this meeting, and that a copy be sent to the respective families.

(Signed.)

C. COOPER,
J. P. BARNES,
J. P. EDGE,
Committee."

The resolutions were unanimously adopted by a rising vote.

D. Z. Shook, member from Franklin, read an essay on "The Relation of Landlord and Tenant," the subject matter of which was discussed by Messrs. Cooper, Woodward, Eves, McKee, Sexton, Johnston, Kistler and Secretary.

W. H. H. Riddle, member from Butler, read an essay on "Delusions," which was discussed by Hon. R. E. Pattison and Messrs. Seanor, Lawson, Howard, Fairchilds, White, Eves, Woodward and others.

Hon. G. W. Hood, of Indiana, read an essay on "What a Farm Deed Includes," and answered numerous inquiries from Messrs. Searle, Read, Reeder, Lawson, Powell, Underwood, Dr. Edge, Jaekel, Shanafelt, Patterson, Herrington, Fague, Hoffa, Huckell and others.

J. L. Stone, Waverly, Pa., delivered an address on "The Breeding of Dairy Cows," when, on motion, adjourned until 1.30 p. m.

Thursday Afternoon, October 18, 1894.

Board called to order at 1.30 p. m., by Hon. R. E. Pattison in the chair.

The Secretary annouced that a special train would leave the college at 4 p. m. for Bellefonte and Tyrone, making connections for all points east and west, when it was resolved that the Board should adjourn promptly at 4 p. m.

Hon. A. G. Seyfert, of East Earl, Lancaster county, read an essay on "Useful Education."

Prof. John Hamilton, State College, Pa., read an essay on "The Successful Farmer a Specialist."

Hon. George T. Powell, of New York, delivered an address on "The Causes of Agricultural Depression, and Some of the Remedies."

Mr. Cooper, of Lancaster, offered the following resolutions, which were adopted by acclamation:

"Whereas, This being the last meeting of the Board of Agriculture at which His Excellency, Governor Pattison, will, by reason of his office as Governor of the Commonwealth, preside, it is but fitting that this Board shall express some sentiment of their appreciation for the uniform courtesy with which he, as our presiding officer, has so patiently and faithfully filled the position; therefore,

Resolved, That the members of the Board of Agriculture now assembled at the State College, at the last session for the year 1894, do hereby extend to Governor Pattison our sincere gratitude for his patient and untiring interest in the proceedings, and our great regret that the time is so near when our associations shall be severed."

Mr. Gundy, of Union, offered the following, which was unanimously adopted:

"Whereas, The State Board of Agriculture and the delegates and visitors have, during their visit, been so kindly treated, so hospitably entertained and have had so much attention paid to them to enable them to examine the college and Experiment Station, and to get to and from our place of meeting; therefore,

"Resolved, That the members of the Board, delegates and visitors, hereby express to Drs. Atherton and Armsby, and to the officers of the college and the manager of the college farm, our high appreciation of their kindness and attention, assuring them that we go away with a still higher appreciation of the educational work they are doing for the young men and women of our State, as well as for the entire farming community of the State, the nation and the world."

On motion adjourned, to meet at Harrisburg, Pa., on the fourth Wednesday in January, 1895.

EXTRACTS FROM THE ANNUAL REPORT OF THE SECRETARY.

WORK OF THE BOARD.

The past year has been one of unusually increased work on the part of the members and Secretary of the Board. The institutes, which have increased from fifteen or twenty to one hundred and thirty-nine, have necessarily added greatly to the duties of all of the members, and at the same time added materially to the office work. Those not acquainted with the work necessary to organize and carry out even one local institute, would be surprised at the extent of the correspondence, and the amount of time devoted to it by a conscientious member of the Board.

It is perfectly safe to assert that the addition of the institutes to the duties of the members and Secretary has more than doubled the amount of office work, and as there has been but a very slight increase in the amount of the annual appropriation ($1,500), for office expenses, it has become evident that, in order to relieve the Secretary and permit him to devote more of his time and attention to other matters, additional office assistance must be procured, and this is only obtainable by an increase in the annual appropriation. The contingent fund of the Board of Agriculture is the lowest, in proportion to its membership and duties, of any in the State government, while the interest represented by it is the largest and most extended of any in the State.

The annual appropriation of fifteen hundred dollars for office expenses must cover the items of clerical help, postage, express charges, messenger and sundry other items, many of which are directly chargable to the increased duties which the Legislature has, from time to time, placed upon the Board. The rule has been that after the most economical expenditures for postage, express charges and other necessary office expenses, to devote the small balance to the employment of an office assistant, but, even with the greatest possible care in expenditures, the amount left for this purpose has been entirely inadequate, and the Secretary has been compelled to give his attention to minor matters of routine work in the office when matters of very much greater importance were demanding attention elsewhere. From this cause it has been impossible for the Secretary to give the attention to contagious diseases of live stock which the nature of the work requires, and as a consequence he has been compelled to employ more veterinary assistance than usual, and thus make increased drafts upon the small fund appropriated for that purpose.

These and other reasons which will be apparent to every member of the Board, make it evident that the time has come when it is absolutely necessary that the Board should have an increased appropriation for office expenses, and that if this increase cannot be obtained by an increase in this specific appropriation, it should be obtained from some one or the other of the specific funds at the disposal of the Board.

The rapid and great increase in the consumption of commercial fertilizers and the desire of the manufacturers of this class of goods to meet it, has greatly increased the work of obtaining samples for analyses under the provisions of the Act of June 28, 1879, and the same conditions have also increased the labor of recording and publishing the results of analyses made under the provisions of the same act.

During the year ending August 1, 1894, the agents of the Board selected very nearly twenty-five hundred samples of fertilizers; when this work is contrasted with that of the year 1880, when about six hundred and fifty samples were selected, the increased magnitude of the work is apparent. In fact, it is safe to estimate that the work of the selection of samples, recording and publishing results and attending to correspondence directly incident to this work constitutes fully one-half of the office work of the Board.

It was evidently the intention of the Legislature that the Act of June 28, 1879, should be entirely self-supporting, and that it should cause no draft upon the State treasury for any portion of its work or enforcement. In view of these two points, I consider it but just that the Act of June 28, 1879, should be so modified by amendment, that all expenses fairly chargeable to the work of fertilizer control and analyses should be charged to the special fund created by the act, and thus relieve the appropriation for office expenses from this extensive draft, which, as is evident from the construction of the fertilizer law, the Legislature did not intend should be thus chargeable.

The passage by the Legislature of the Act of May 9, 1889 (to prevent the spread of contagious diseases among domestic animals), greatly added to the office work of the Board, and imposed new and increased duties upon its Secretary. This work, like all imposed upon the Board, has greatly increased, and bears about the proportion to former years as does the work of fertilizer analyses. This fund was also evidently intended by the Legislature to be self-supporting, and to be carried out by the appropriations made, but the amount of one thousand dollars per annum is entirely inadequate for the purposes of the act. This amount would about meet the necessary expenses for veterinary assistants when glander only was taken into consideration, and when glandered horses were the only animals to which the provisions of the act were extended.

Since tuberculosis in cattle has been added to the list of diseases embraced by the act, the annual appropriation of one thousand dollars has proven to be insufficient for the first five months of the year, leaving the Board during seven months of the year entirely without means of defense in case of the outbreak of any contagious disease among live stock, and also utterly unable to carry out the provisions of the law in reference to disease and outbreaks now included in the work. The inference is that when it imposed duties upon the Board, the Legislature intended to afford the means to carry out these duties by appropriations sufficient, but this has not been done, and the Board finds itself, before the middle of the fiscal year, unable to carry out the plain provisions of the law for the want of funds.

During the past year the Secretary has been compelled to call upon members of the Board for assistance in the work of investigating and suppressing outbreaks of contagious disease in their respective counties. In this manner Messrs. Herr, Cooper, Hutchinson, Gundy, Critchfield and Garretson have given the Secretary efficient assistance, but when it is remembered that members of the Board served without compensation of any kind, this addition of duties appears to be a grave imposition, to which the Secretary has been forced by circumstances entirely beyond his control.

The additional duty of holding local or farmers' institutes, which the Legislature has placed directly upon the members of the Board, has also greatly added to the labors of the position, and carries with it no compensation of any kind. This of itself is an additional argument in favor of an increase in the appropriation for office expenses, which will enable the Secretary to obtain adequate office assistance which will release him for increased duties in arranging for and holding farmers' institutes. An assistant who could readily take up nine-tenths of the routine work of the office would release the Secretary for duty in work connected with contagious diseases of live stock and holding institutes, which would also relieve the members of the Board in a corresponding degree, and enable the Board to give more prompt attention which, in the case of contagious disease of live stock, is so essential and important, for by the time that the resident member of the Board has been notified, an outbreak of glanders, anthrax or other contagious disease may have made such progress as will greatly increase the expense of their suppression.

The total amount of the annual appropriation for the work of the board is $16,500.00, of which $9,500.00 is exclusively for the expenses of farmers' institutes; the annual appropriation for members expenses is $2,000.00, which, as our membership is now constituted, is but $27.49 cents per member; this is an amount very much below the average appropriated during the earlier history of the Board, when it sometimes reached an amount of over $45.00 per member, the decrease being largely due, in the face of increased annual appropriations, to the rapid increase in the membership of the Board.

It may be reported that the past year has been one of unusual activity in the work of the Board, and that in all departments there has been an increase in the amount of work and attention required, and it is equally evident that the work required, as outlined by various acts of assembly, has been curtailed and weakened by the fact that an insufficient amount of funds has been at our disposal.

MEMBERSHIP IN THE BOARD.

At the initial meeting of the Board of Agriculture, held at Harrisburg, February 1, 1877, thirteen counties were represented by properly accredited delegates. The present roll shows a membership of seventy, distributed as follows:

Ex-Officio members,	6
Members appointed by the Governor,	3
Members elected by county agricultural societies,	61
	70

In many of the counties of the State, the election of a member of the Board of Agriculture creates more interest than that of any other officer of the agricultural society, and the closeness of the contest in some counties evidences the attention given to the position.

Members from county agricultural societies are elected under the following provisions of Section 1, of the Act of May 8, 1876:

"The Governor of the Commonwealth, the Secretary of Internal Affairs, the Superintendent of Public Instruction, the Auditor General, the president of the Pennsylvania State College, and one person appointed from or by each agricultural society in the State, entitled under existing laws, to receive an annual bounty from the county, and three other persons appointed by the Governor with the consent of the Senate, shall constitute the State Board of Agriculture."

The Act of June 2, 1893, provides, "That the Secretary of the State Board of Agriculture shall be ex-officio a member of the Board of Agriculture and of the board of trustees of the Pennsylvania State College."

During the legislative session of 1893, the following bill was introduced, but failed to become a law from the fact that it, with a large amount of other unfinished business, was left upon the calendar of the House of Representatives:

AN ACT

To amend an act to establish a State Board of Agriculture, approved May eighth, one thousand, eight hundred and seventy-six.

SECTION 1. *Be it enacted, &c.*, That section one of an act to establish a State Board of Agriculture, approved the eighth day of May, one thousand eight hundred and seventy-six, which reads as follows:

"That the Governor of the Commonwealth, the Secretary of Internal Affairs, the Superintendent of Public Instruction, the Auditor General, the president of the State College, and one person appointed from or by each agricultural society in the State, entitled under existing laws to receive an annual bounty from the county, and three other persons appointed by the Governor with the consent of the Senate, shall constitute the State Board of Agriculture," be and is hereby amended so that the said section one shall read as follows, namely:

That the Governor of the Commonwealth, the Secretary of Internal Affairs, the Superintendent of Public Instruction, the Auditor General, the president of the State College, the Secretary of the State Board of Agriculture, and three other persons appointed by the Governor of the Commonwealth with the consent of the Senate, one person elected by each county agricultural convention in the State, notice of said convention to be given by the Secretary of the State Board of

Agriculture in at least one county paper two weeks before the date herein designated, and which convention shall be composed of duly qualified delegates or representatives from agricultural or horticultural societies, farmers' clubs, granges of the patrons of husbandry, alliances and other agricultural organizations having a bona-fide membership of ten or more persons. *Provided*, That where any society, grange, alliance or association shall have a membership of not less than ten nor more than thirty-three persons, they shall be entitled to one delegate or representative, and for every additional thirty-three members of such society, grange, alliance or association, it shall be entitled to one additional representative, and said delegates shall annually meet at ten o'clock a. m. on the first Tuesday in December at their respective county seats and elect said member, who shall constitute the said Board of Agriculture. *Provided*, That to entitle any society or organization to representation in said convention, the credentials of its delegates shall bear the certificate of its presiding officer and secretary, which shall set forth the number of members of such society or organization, and that such society or organization was organized at least one year prior to the assembling of the convention, which certificate shall be verified by the oath or affirmation of said presiding officer or secretary. *Provided further*, That the secretaries of the societies or organizations represented in said convention shall forward a duplicate of said certificate to the Secretary of the State Board of Agriculture, to be filed in his office."

This act, if again presented, should be amended so that the average attendance at meetings of the organization electing should constitute the gauge by which the number of delegates which any organization is entitled to, should be fixed, as it is manifestly unjust to permit an organization having a large number of members upon its roll, but which holds meetings which are attended by but a small proportion of its membership, to elect as many delegates as another organization with an equal number of members upon its roll, but holding meetings of a larger proportion of members.

Organizations might be instanced having a large membership, the meetings of which are practically under the control of a board of managers who thus control the vote of the organization, while but a very small percentage of the members on the roll ever attend the meetings for business.

Any such plans for the election of members of the Board should secure a representation of delegates at the proposed convention which shall bear some proportion to the number of its members who take an interest in its meetings, and such representation should, therefore, be based upon the average attedance at the meetings, and not upon the membership as shown by the roll of the organization.

FARMERS' INSTITUTES.

For purposes of comparison, it is perhaps unfortunate that the general year of the Board ends the "fourth Wednesday of January of each year," while its fiscal or appropriation year ends May 31st; this conflict of dates prevents the annual report from covering the whole of the year for which it is issued, and a report relating to institutes must necessarily refer to the year ending May 31st of the year for which it is issued.

During the year ending May 31, 1894, the Board held one hundred and thirty-nine local or farmers' institutes; nearly every county of the State made application for its proportion of the institute fund, and since that date and for the year commencing June 1, 1894, such counties as did not make application the preceding year have filed their applications, and the advisory committee has granted all applications thus made.

During the year ending May 31, 1894, the fund was divided among the counties of the State by a grant of $75.00 to each and every county and a further apropriation of two cents for each farm in the county as shown by the census of 1890. This fund is placed under the charge of the member of the Board from the county, and he is held strictly accountable for its expenditure under rules laid down by the Board and its advisory committee.

In counties not represented in the Board, applications were received from individuals either known to members of the Board or who furnished proper credentials showing their responsibility and identification with the agricultural interests of their county, and the committee gave the county quota to them, subject to the same rules and provisions as if they had been members of the Board.

During the past year three counties which thus held institutes have elected members of the Board, and their institute fund will hereafter be placed under the care of their properly delegated representatives. One or two of the counties not already represented have taken the initiatory steps for representation, and the time is evidently not far distant when every county in the State will be properly represented.

The fact that the institute fund of each county was given to the member from the county causes a variation in the numbers of institutes held. In some counties the members decided that one or two institutes, attended by assistants from a distance, would best answer the requirements of his constituents; in other counties the member decided that the best interests of their districts would be best served by a number of institutes held mainly with local talent. In other cases the county representative entered into an arrangement with members from adjoining counties by which non-resident institute workers could be secured at greatly reduced expenses to all concerned.

The following table shows the number of institutes held in each county, and the reader is referred to the proper list in tabulated form in another portion of this report for full information as to dates and places of holding the institutes:

Lancaster,	7
Chester,	6
Mercer,	4
Susquehanna,	4
Westmoreland,	4
York,	4
Armstrong,	3
Bradford,	3
Centre,	3
Clarion,	3
Clearfield,	3
Crawford,	3
Erie,	3
Fayette,	3
Greene,	3
Indiana,	3
Jefferson,	3
Lackawanna,	3
Northumberland,	3

The counties of Adams, Allegheny, Berks, Bucks, Butler, Carbon, Clinton, Columbia, Cumberland, Dauphin, Fulton, Huntingdon, Juniata, Lawrence, Luzerne, Monroe, Montgomery, Montour, Northampton, Perry, Schuylkill, Snyder, Tioga, Venango, and Wayne, each held two institutes, and other counties not enumerated, held one each.

In this connection we would emphasize the point that the number of institutes held is not necessarily a gauge of the benefit conferred by the fund; large counties, as shown by the explanation of the manner in which the fund was distributed, received a large proportion, and could readily hold a greater number of institutes; and it should also be remembered that different sections of our State demand different classes of institute workers, and that the resident member of the Board is naturally the best judge of what his constituents demand in this line.

For the fiscal year ending May 31, 1894, the appropriations, by counties, for local farmers, institutes, were as shown by the following table. The respective amounts are based upon the allowance of $75.00 to each county, and two cents per farm, as shown by the census of 1890.

Counties.	Number of farms, 1890.	Increased allotment.	Total.	Counties.	Number of farms, 1880.	Increased allotment.	Total.
Adams,	3,336	$65	$140	Lackawanna,	1,579	$30	$105
Allegheny,	5,343	105	180	Lancaster,	9,440	190	265
Armstrong,	4,127	80	155	Lawrence,	2,575	50	125
Beaver,	2,672	55	130	Lebanon,	2,400	50	125
Bedford,	3,220	65	140	Lehigh,	3,378	70	145
Berks,	6,952	140	215	Luzerne,	2,850	55	130
Blair,	1,490	30	105	Lycoming,	3,352	65	140
Bradford,	6,415	130	205	McKean,	1,460	30	105
Bucks,	6,364	125	200	Mercer,	5,021	100	175
Butler,	5,364	105	180	Mifflin,	1,143	25	100
Cambria,	2,241	45	120	Monroe,	1,767	35	11
Cameron,	339	5	80	Montgomery,	5,361	105	180
Carbon,	982	20	95	Montour,	914	20	95
Centre,	2,180	45	120	Northampton,	3,396	70	145
Chester,	6,119	130	195	Northumberland,	2,361	45	120
Clarion,	3,115	60	135	Perry,	2,314	25	100
Clearfield,	2,812	55	130	Philadelphia,	801	15	90
Clinton,	1,162	25	100	Pike,	960	20	95
Columbia,	2,415	50	125	Potter,	2,128	45	120
Crawford,	7,786	155	230	Schuylkill,	2,680	55	130
Cumberland,	2,944	60	135	Snyder,	1,667	35	110
Dauphin,	2,677	55	130	Somerset,	3,471	70	145
Delaware,	1,469	30	105	Sullivan,	958	20	95
Elk,	759	15	90	Susquehanna,	4,716	95	170
Erie,	5,483	110	185	Tioga,	4,552	90	165
Fayette,	3,320	65	140	Union,	1,224	25	100
Forest,	491	10	85	Venango,	3,054	60	135
Franklin,	3,295	65	140	Warren,	2,881	60	135
Fulton,	1,305	25	100	Washington,	4,514	90	165
Greene,	2 924	60	135	Wayne,	3,659	75	150
Huntingdon,	2,391	50	125	Westmoreland,	5,339	105	180
Indiana,	4,644	95	170	Wyoming,	1,782	35	110
Jefferson,	2,531	50	125	York,	7,730	155	230
Juniata,	1,609	30	105				

When the Advisory Committee met to take into consideration the distribution of the institute fund for the year commencing June 1, 1894, it was evident that several counties which did not make application the preceding year, would make a request for their share of the appropriation; it was also evident from the greatly increased demands made upon the Secretary of the Board for attention to contagious diseases of live stock, that a large proportion of the fund would be necessary for his traveling expenses. These two causes, coupled with the fact that, at the settlement with the Auditor General, June 1, 1894, there was but $8.13 left in the fund for farmers' institutes, made it plainly evident to the committee that it would not be safe to make a distribution of the fund upon the same basis as the preceding year. After due consideration, it was decided to reduce the minimum appropriation per county from $75.00 to $65.00, and to allow the two cents per farm, as in the preceding year. The reader will, therefore, in order to obtain the ratio of each county for the year commencing June 1, 1894, deduct $10.00 from the apropriation to the county for the preceding year.

The official list issued by the Board contains the names of one hundred and twenty-five ladies and gentlemen who have consented to make addressess or read papers at our farmers' institutes. Many of them are practically acquainted with agriculture in its various conditions, and all are competent to treat their topics in a practical manner. Of these, nine of the professors at the Pennsylvania State College have consented to deliver lectures upon topics connected with scientific agriculture, and in addition to these, sixteen members of the State Veterinary Associaion have volunteered to read papers upon diseases of animals.

The professors from the State College present a list of thirty-two distinct topics; the members of the State Veterinary Association, give twenty, and miscellaneous writers and speakers name four hundred and seventy distinct subjects, thus giving us the services of one hundred and twenty-five speakers upon five hundred and twenty-two topics.

The experiences of another year add greatly to the force of the argument which we have previously used, in favor of more general and combined attempts on the part of institute managers to hold their institutes in circuits, so that the assistance of the best institute help may be secured at a reduced rate, by making the engagement for a definite number of weeks. This is forcibly illustrated by the experience of Messrs. Cooper and Herr during the past autumn, by which they, by correspondence, were enabled to arrange a circuit of meetings in adjacent counties, extending over a period of nearly two months. The services of Geo. T. Powell, of New York, were secured for the time required, and the average expenses of the institutes in the circuit was thus greatly decreased. The experience of these and other members of the Board clearly indicates that the time is not far distant when our institute work will demand a greater centralization of control, possibly in the hands of some one individual appointed by the Board, who shall have power, after consultation with the resident member of the Board, to fix institute dates in such circuits as will enable the Board to still further economize in its expenditures in this direction.

The attendance at institutes, except when influenced by bad weather, has been greater than during any previous year, and it is evident that the farmers of our State are becoming thoroughly awake to the benefits which may be gained by such gatherings, and that they are taking part each year with greater strength.

It is also a matter of congratulation to note that except in a few cases, in which local feeling has entered into the question, that our granges, alliances and other agricultural and horticultural organizations are entering into the work, and are heartily co-operating with the resident member in an attempt to make county institutes a still greater success. It is also noticeable that the members of the Board are each year becoming more and more convinced of the great importance of securing the active co-operation of every organization within their county. This feeling will undoubtedly increase (unless in special cases where it is interfered with through local feeling), until every organization in any way connected with agriculture will heartily co-operate with the Board in increasing the efficiency of its institutes.

ANALYSES OF FERTILIZERS.

Section 4th of the Act of June 28, 1879 ("To regulate the manufacture and sale of commercial fertilizers,") provides that "It shall be the duty of the Board of Agriculture to analyze such specimens of commercial fertilizers as may be furnished by its agents, said samples to be accompanied with proper proof, under oath or affirmation, that they were fairly drawn; the fee for such analyses shall be determined by the executive committee of the Board, and shall be based upon a fixed rate for each determination, and shall in no case exceed seventy-five per centum of the usual price paid for such services, and shall be payable from the treasury of the Commonwealth in the manner now provided by law."

Under the authority granted the Board by this section, six regular agents have been appointed, and their work has also been supplemented by that of members of the Board, each of whom, by special resolution, is made a special agent for his own district. These agents have, during the season ending August 1, 1893, sent in 1725 samples of fertilizers, which were sent to the chemist, and the analyses were made by chemists who were not acquainted with the name of the manufacturer, or the name of the fertilizer. In this manner strict and impartial justice has been secured for both consumer and manufacturer, and results secured not obtained in any other State in the Union. As a result of this work, the Pennsylvania consumer of fertilizers obtains his goods of a better quality, and at a lower price than that in most other States, and it is claimed by those who are in a position to judge, that by this work alone, the Board of Agriculture saves fertilizer consumers at least $350,000 annually, or an amount equal to nearly twenty times the whole cost of the Board, including the expenses of farmers' institutes, or, excluding institutes, an amount fully equal to forty-four times the actual cost of the Board of Agriculture, so that, if it performed no other work, the Board could well afford to go before the tax payers of the State upon this record alone.

The 2nd section of the Act of 1879, provides that all manufacturers of fertilizers selling or offering their goods in our State must take out a license, and pay into the State treasury a license fee, the amount of which is based upon the number of brands sold, and the amount of each disposed of. The 5th section of the Act provides that "The money paid into the treasury under the provisions of this Act shall constitute a special fund from which the cost of such analyses shall be paid; Provided, That the total amount thus expended in any one year shall in no case exceed the amount paid into the treasury during the same year, and that any moneys remaining in this special fund at the end of the year (August 1st), shall be passed into the general fund for the use of the State."

In point of fact it has seldom been deemed necessary to expend all of this fund, and each year a small balance has been covered into the general fund of the State, but inasmuch as the intent is that the whole of the fund shall be made use of, this balance is scarcely worthy to be taken into account. In addition, then, to the profit derived by the consumer of fertilizers by the rigid enforcement of this Act, we can add further that the benefit and protection thus afforded is obtained without any expenses to the tax payer, the whole cost being charged annually to the special fund created by section 5th of the Act.

Of the 1725 samples drawn during the season ending August 1, 1894, 1260 were of complete fertilizers, 241 were of ground bone, and 224 of South Carolina Rock; and it is probable that, as these samples were drawn without any special care in their selection, that of the fertilizers on sale in our State, seventy-three per cent. belong to the class styled "Complete," fourteen per cent. are ground bone, and thirteen per cent. are South Carolina Rock.

During the same year (ending August 1, 1894), there were licensed and recorded for sale in the State, eight hundred and two distinct brands of fertilizers, of which five hundred and fifty were complete fertilizers; one hundred and five were ground bone; ninety-three were South Carolina Rock, forty were Alkaline fertilizers and fourteen were dissolved animal bone.

The work of analyses has been performed by Dr. William Frear, of the Pennsylvania State Experiment Station, and every possible precaution has been taken to guard it against errors of all kinds; all analyses have been made in duplicate, and the results sent to the manufacturer, and, in cases of protest, another analysis has been ordered; and if the results of the second analysis have verified the original report, the State has paid for them, and in this way, so far as known, satisfaction has in all cases been given to all parties interested.

The results of all analyses have been regularly published in tabulated form and sent to all who have requested them; in various forms, at least 32,000 copies have been sent out, and many consumers of this class of goods make their selections from information obtained through our tabulated analyses list.

THE TRADE OR COMMERCIAL VALUE OF FERTILIZERS.*

In carrying out the intent of the Act of June 28th, 1879, in protecting the consumer of commercial fertilizers from fraud, one of the most difficult problems which meets the officers of the Board is that of obtaining a satisfactory schedule from which to calculate the "Comparative Commercial Value" of the fertilizer. The cost of the various ingredients can be obtained by consulting the trade journals which record the sales of fertilizer supplies, but more or less trouble is constantly arising from the variation in the market value of these supplies, not only during the different months in the year, but also during the terms of years during which the same valuations are to be used.

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*Attention is directed to an article by Dr. Frear, upon the same topic, in another portion of th report

It has always been the desire of the Advisory Committee to change these valuations as little as possible, and having obtained a satisfactory list, to use it as long as the varying condition of the market will permit. Each change in the valuations prevents the consumer from comparing the same brands during different years. Thus, the values having been established for a given year, if a change is made during the succeeding year and that change should be, as it usually is, towards lower prices, the consumer who is not conversant with such matters, is likely to do the manufacturer the injustice of supposing that the standard of his favorite brand has been lowered, when in reality, it contains precisely the same character of ingredients that it did in the preceding year.

The schedule of trade values adopted by the Board has not been changed during the past five years, although there has been a decided decrease in the market prices of some classes of fertilizer supplies. During that time phosphoric acid has decreased considerably in cost, and there has also been some falling off in the cost of potash. The effect of the retention of the trade values adopted five years ago, has been to give the analysis of Ground Bone and of Acidulated South Carolina Rock, an abnormally high valuation, and, when compared with those of other States in which frequent changes are made, the Pennsylvania valuations have appeared high, although the fertilizers, and also the analysis, may have been practically the same.

With this condition of affairs before it, the Advisory Committee have believed that the time had arrived when our valuations could with propriety and with the least possible friction, be changed, and they have accordingly adopted a series of trade values, selected by Dr. Frear, which it is believed will much more nearly correspond with the present market value of fertilizer supplies.

The commercial or trade value of a fertilizer is made up of the following items:

1. Cost of the ingredients.
2. Cost of mixing.
3. Cost of bagging and weighing.
4. Freight to consumers' station.
5. Commissions or profit to agents.

The cost of the ingredients can readily be obtained from the markets of any of our larger cities, and from journals devoted to this special trade, and the market values of each kind of material used in fertilizers may at any time be obtained; these journals show the trade value, for the time being, of phosphoric acid, potash and nitrogen in their various forms.

The cost of mixing varies somewhat with the amount to be mixed and the character of the materials used, but it can be closely estimated and does not materially vary from year to year.

The cost of bagging and weighing is determined largely by the cost of the bags, which will also depend somewhat upon the number of bags used, and the slightly varying character of the material of which they are composed; it is also somewhat varied by the fact that some manufacturers use bags specially prepared, with a view to prevent their rapid deterioration from the materials which they contain.

The freight to the consumers' station will vary greatly, but Dr. Frear has taken that paid from our fertilizer centres to prominent points in our State, and from a large number of quotations has obtained a fair average of $2.00 per ton.

The items of profits or commissions to agents is more difficult to determine, and can only be given approximately. When the agent purchases the fertilizer from the manufacturer, the latter loses all control over the price to be asked for it, and the amount of profit which the agent may demand will be governed by the competition with which he meets. We have found agents within three miles of each other making a difference of more than one dollar per ton in the selling price of the same brand of South Carolina Rock and Ground Bone, and in some localities, the competition is so close that we have known agents to handle S. C. Rock at a margin of but twenty-five cents per ton over cost and freight.

When the manufacturer sells direct to the agents, we also find cases in which plain Acidulated S. C. Rock has been branded "Soluble Bone," and although sold to the agent as such and at corresponding prices, it is sold to the consumer who does not understand fertilizer brands, as a complete fertilizer, at, in some cases, nearly double its cost to the seller.

These and other reasons which might readily be given, make this one of the most difficult on the list, and the committee have therefore deemed it advisable to add for agents' commissions, an allowance of twenty per cent. of the cash value of goods, ready for shipment.

All of the items which enter into the cost of a fertilizer will also vary somewhat with the amount mixed at one time. Thus, a manufacturer can purchase the materials, mix, bag and ship 1000 tons at a less rate per ton than he can 100; the manufacturer who, by the use of capital, can purchase his materials at the lowest stage of the market and can hold them until needed, can always buy cheaper than one who is compelled to defer his purchases until a large accession of purchasers and increased demand have forced prices higher. Many manufacturers can, by the use of by-products from other manufactured articles, obtain a portion of their supplies at a comparative low cost, and have the choice of either giving their customers the benefit of this, or of obtaining a greater profit for themselves.

It is sometimes the case that the market price of nitrogen will vary sufficiently to make the difference between profit and loss in the manufacture of a fertilizer, especially when competition is close and the market prices low. The manufacturer who can combine the manufacture of sulphuric acid, sulphate of ammonia and bone black, may realize a profit where another, who is compelled to purchase his supplies from a manufacturer, may fail to realize his expenses.

After consultation, the Advisory Committee has decided to adopt the schedule of valuations shown in the first column of the following table; this valuation was prepared by Dr. Frear, and is believed to be as just to both manufacturer and consumer as can be obtained.

	Values: 1894-5.	*Values: 1888 to 1894.*
Nitrogen in ammonia salts,	19	19
Nitrogen in nitrates,	14½	17
Nitrogen in dry and fine ground fish, meat, blood and in *mixed fertilizers*,	18½	19
Nitrogen in cotton seed meal and castor pomace,	15	15
Nitrogen in fine bone and tankage,	12½	16½
Nitrogen in fine-medium bone and tankage,	11	13
Nitrogen in medium bone and tankage,	9	10½
Nitrogen in coarse bone and tankage,	5½	8½
Nitrogen in hair, horn shavings and coarse fish scrap,	7	8
Phosphoric acid soluble in water, in bone fertilizers,	6	8
Phosphoric acid soluble in water, in rock fertilizers,	4	8
Phosphoric acid soluble in ammonium citrate, in bone fertilizers,	5½	7½
Phosphoric acid soluble in ammonium citrate, in rock fertilizers,	3½	7½
Phosphoric acid insoluble in ammonium citrate,	2	3
Phosphoric acid in fine bone and tankage,	4	7
Phosphoric acid in fine medium bone and tankage,	3½	6
Phosphoric acid in medium bone and tankage,	2½	5
Phosphoric acid in coarse bone and tankage,	2	4
Phosphoric acid in fine ground fish, cotton seed meal, castor pomace, and wood ashes,	5	7
Potash, in high grade sulphate and in forms free from muriate (chloride),	5½	6
Potash as muriate,	4½	4½

In addition to the valuation obtained by the use of the figures given in the above table, the following allowances are made for freight, bagging and mixing:

On all complete fertilizers, $4.00 per ton for bagging, mixing and freight.

On all alkaline fertilizers, the amount of $4.00 for the same items.

On all ground bone, an allowance of $3.00 per ton for bagging and freight.

On all Acidulated South Carolina Rock, $3.00 per ton for bagging and freight.

The total item thus allowed is made up as follows: Two dollars per ton for freight; one dollar per ton for mixing, and one dollar for bagging.

In order to meet the cases of some manufacturers who add nitrogen, in small amounts, to their South Carolina Rock, it has been decided, upon the advice of Dr. Frear, to make an allowance of one dollar additional per ton in all cases in which the added nitrogen amounts to one-half of one per cent. or more, and that in all cases in which, the addition having been claimed in the recorded analysis, the amount found amounts to less than one-half of one per cent. the analysis will be placed among those of South Carolina Rock, and an allowance be made for the actual amount of nitrogen found, and attention called to it by a foot-note in the table.

The following table, prepared by Dr. Frear, gives the reader an opportunity of comparing the valuations obtained by the table recently adapted for 1894-5, with those of our former schedule in force from 1888 to 1894, and also with those of the New England States and with Maryland; it will be noted that this table shows that our present valuations are above those of other States as follows:

For Complete fertilizers,	$0.04	per ton.
For Dissolved animal bone,	1.10	" "
For South Carolina Rock,	0.34	" "
For Ground bone,	0.18	" "
And that it is lower on Rock and Potash by	2.96	" "

	Complete fertilizers.	Rock and potash.	Dissolved animal bone.	South Carolina rock.	Ground bone.
Number of samples included	334	27	17	64	75
Average selling price,	$29 54	$21 82	$27 22	$16 98	$31 11
Valuation by proposed schedule,	29 53	18 26	28 82	17 32	29 72
*By former schedule of Pennsylvania,	28 84	18 95	28 32	17 32	36 09
†By New England schedule,	20 98	16 03	20 93	17 45	28 92
*By Maryland schedule,	23 41	17 20	22 42	17 88	26 00

*Includes no allowance for freight or commission.

†Includes no allowance for mixing, bagging, freight or commission.

COMPENSATION FOR ANIMALS KILLED.

One of the most difficult problems which meets the State officers in their work of preventing the spread of contagious diseases among live stock, by killing the animals, is that of regulating the compensation allowed for the animals destroyed. It is true that an animal afflicted with a contagious disease is not only practically worthless, but is also a menace to surrounding stock belonging to the same or other owners; but it also at the same time has a certain value to the owner. A horse suffering from chronic glanders may perform good service for many years, although it, at the same time, may infect other animals with which it comes in contact; a cow suffering with tuberculosis in its earlier stages, although a dangerous addition to a dairy, may continue to give milk, and otherwise prove profitable for several years; either the horse or the cow have a value to their owners, and if the animal is condemned and killed for the benefit of the public, this compensation should be given the owner. It is true that under the police powers of the State the officers are justified in condemning the animal without any compensation to the owner, but it is also equally true that without the co-operation of our stock owners, all attempts to stamp out any special disease will prove futile.

The solution of the question resolves itself into two forms, under one of which, without adequate compensation, the funds of the State must be expended in hunting up the disease, and in the other, with adequate compensation, it is made to the interest of the owners to report the real or supposed cases to the State officers.

Our work in stamping out contagious pleuro-pneumonia has clearly proven the economy of proper compensation to the owners of condemned stock, and much of the success and the comparatively light expenses of the work, is in reality due to the fact, that in every instance the owners were satisfied before the animals were killed.

The Act of May 9, 1889, under which the work of the past three or four years has been conducted, provides that "when it shall become necessary or expedient to kill any animal or animals to prevent the spread of contagious disease, it, or they shall first be appraised by sworn appraisers, who shall have due consideration for the actual condition of the animal or animals at the time of the appraisement, and the owner or owners shall be entitled to receive from the Secretary of the State Board of Agriculture a certificate of value, which may be paid from current appropriations, or by a subsequent appropriation by the Legislature: Provided, that the amount of such certificates issued in any one year shall not exceed the sum of twenty-five hundred dollars."

Under the provisions of this section, all glandered horses found have been condemned, paid for and promptly killed, and in such cases the "certificate" contemplated in the law, has been the check of the Secretary of the Board of Agriculture. With but very few exceptions it has not been found necessary to call in the services of appraisers, the State officers being able to agree with the owner for a price which was satisfactory to both parties.

The effect of this arrangement has been that all owners of supposed diseased stock, and the veterinary surgeons having diseased stock in charge, have promptly notified the Secretary, and immediate attention has thus been given to the cases. The plan has proven eminently satisfactory, and the provision would have been ample for the work of reducing the spread of tuberculosis but for the limitation in the amount to be thus used in any one year; the amount has therefore proven to be sufficient for the prompt destruction of all glandered horses and mules, and until the present year, during which tuberculosis has been included, the full amount has never been needed; after the decision, of the Governor and Secretary of the Board, made early in August last, that tuberculosis animals should be included, at least as far as the funds in hand would permit it, has made serious drafts upon the fund and made it evident that if we are to continue to extend the law to cases of tuberculosis (and it should undoubtedly be so extended), a large amount will be absolutely necessary.

The Act of May 12, 1894, of the State of New York, makes the following provision for compensating the owners of animals condemned and killed:

"Section 63: To determine the value of such animal, the comptroller shall designate some competent, disinterested person residing within the judicial district in which such animal may be, to act as appraiser, with an appraiser to be selected by the owner of such animal, who shall promptly fix a time when they shall view such animal and shall proceed to appraise the value thereof. In case of a disagreement between the two appraisers, the third appraiser shall be selected by them, and the estimate of the value of either two of them shall be final. The animal shall be appraised at its sound value, provided, however, no single unregistered animal shall be appraised at more than sixty dollars; and no horse affecaed with glanders shall be appraised at more than fifty dollars. Each appraisal shall be in writing. signed by the appraiser or appraisers agreeing, and shall be delivered by them, if the animal be suspected of tuberculosis, to the veterinary practitioner in charge of such animal, and if the animal be a horse affected with glanders, to the secretary of the local board of health having jurisdiction thereof. Upon the delivery of such appraisal, such animal shall be killed, as hereinbefore provided; and if it be killed on acount of tuberculosis, the veterinary practitioner in charge thereof shall forthwith make a post-mortem examination of the animal; if it shall be discovered on such a post-mortem examination that the animal was affected by tuberculosis, the owner of the animal shall be entitled to receive one-half of the appraised value; provided however that not more than sixty dollars shall be paid for a diseased registered animal, and not more than twenty-five dollars shall be paid for a diseased unregistered animal; but if such examination of the animal killed on account of tuberculosis discloses that the animal was not affected with tuberculosis, the owner shall be entitled to receive the full appraised value. The written appraisal of the value of an animal killed on account of tuberculosis, and a written statement of the result of the post-mortem examination thereof, signed by the veterinary practitioner in charge thereof, shall forthwith be transmitted by such veterinary practitioner to the Secretary of the State Board of Health, who shall file the same in his office. The secretary of the local board of health having jurisdiction in the case of a horse affected with glanders shall, in case such a horse is killed, upon receipt of the written appraisal, signed by the appraiser or appraisers, as hereinbefore provided, forthwith make and sign a certificate of such fact, and transmit such appraisal and certificate to the Secretary of the State Board of Health, who shall file the same in his office. Upon receipt from the veterinary practitioner, in the case of an animal killed on account of tuberculosis, or from the secretary of the local board of health having jurisdiction in the case of a horse killed on account of glanders, such Secretary of the State Board of Health shall forthwith make a written certificate, signed by him, setting forth the name and postoffice address of the owner of the animal killed, and the amount which such owner is entitled to be paid on account of the killing of such animal, and shall forthwith transmit such certificate to the comptroller, who shall issue his warrant upon the treasurer for the payment to such person of the amount so certified, and shall mail the same to such person at his postoffice address as it appears by such certificate. No compensation shall be allowed to any person who shall have willfully concealed the existence of tuberculosis or glanders among his animals, or upon his premises, or who, directly or indirectly, by act or willful neglect, shall have contributed to the spread of of such disease or either of them, and no compensation shall be made under the provisions of this act to any other, for animals killed, unless the animal or animals killed shall have been actually owned and possessed by the owner thereof, within this State, for a period of three months prior to such condemnation. The appraisers to be appointed as aforesaid, by the comptroller, shall hold office during the pleasure of the State Board of Health. Each appraiser so appointed shall receive as compensation, the sum of five dollars per day for each day actually employed, and shall also be paid his actual necessary disbursements, but no claim for services or disbursements shall be allowed or paid unless accompanied by a verified detailed statement thereof."

During the last session of the Pennsylvania Legislature, an Act "To prevent the spread of tuberculosis among domestic animals," was prepared, largely by the Senate and House committees on Agriculture, and which met with the unanimous approval of the Senate on three readings and final passage, and of the House on two readings. It contained the following relating to the payment for animals condemned and killed:

"That when it shall be deemed advisable to condemn and kill any infected animals, and an agreement cannot be made with the owners thereof as to their value, three appraisers shall be appointed, who shall under oath or affirmation, appraise the animal or animals, taking into consideration their actual condition at the time of appraisement, and the owner shall be paid one-half of the said appraisement: Provided, That no such appraisement shall exceed forty dollars for any one animal."

This provision was adopted after considerable consideration of both the Senate and House committees on Agriculture, and would no doubt have proven satisfactory to both the State and the owners of stock, but since its consideration, now nearly three years ago, advances have been made in certain directions, which make it advisable that the provisions for payment for such stock should be somewhat modified, but it may possibly be claimed that this change is provided for in the section quoted, by making the valuation dependent upon the condition of the animal when appraised.

When this clause was adopted by the legislative committee, the use of tuberculin in veterinary practice was not taken into consideration, and its use now calls for some modification of the rules laid down. As an illustration for the necessity for this: Suppose that the State officers are called upon to inspect a herd infected with tuberculosis; a number of the animals may be readily selected by external examination, but the owner, recognizing the benefit of an examination by the use of tuberculin, has this test applied. The animals set apart by external examination have practically little or no value, but it is known that a tuberculin test will condemn others which would, if placed in the open market, command their full value as well animals. The owner is certainly entitled to a larger valuation upon these than upon such as were so far advanced as to show distinct external symptons of the disease.

It is also evident that the provision of the New York law permitting a higher valuation for registered animals is also just, not only to the owner, but also to the State; for, while they have been deprived of their breeding value, by the disease, they still represent to their owner a value greater than that of common or grade animals.

The officers and surgeons employed by the Board have usually been able to agree with the owners upon a price for condemned animals, and thus the cost of appraisements have been saved; but there should be a provision by which a conclusion as to the value could be reached, in cases in which the owner demands an exorbitant price, or in which he refuses to negotiate with the State officers. Such a provision is made in the section quoted from the proposed Act of 1893, by which the State officers are under no obligations to kill the diseased animals, but by which they may place them in quarantine for an indefinite length of time, or until the herd is free from disease.

The eighteen years of practical experience of the writer as a State officer engaged in the condemnation of diseased animals, makes him positive that any plan of compensation which fails to satisfy the average owner, will more or less cripple the result of the work, and increase its cost to the State and individual owner of live stock, and that any plan to be effectual and economical, must receive the active co-operation of the owners and breeders of live stock. It was the opinion of the Senate and House Committees of Agriculture in 1893, that the provision from the proposed act, as quoted above, would secure this co-operation; in fact, before it had been acted upon by the Legislature, this special clause had received the endorsement of all prominent stock breeding organization in the State, and of the State Grange and State Alliance.

DIVISION FENCES.

Notwithstanding the clear and distinct enunciation of the fence laws of our State, by Deputy Attorney General Stranahan, at the annual meeting of 1893 (see Annual Report of 1893, pp. 301 to 311), there still remains some uncertainty on the minds of many of our correspondents as to the legal interpretation of the Act of March 11, 1842, relating exclusively to division fences.

This uncertainty as to the construction of the Act in question, is largely due to the fact that it has been held by some, that by the repeal of the Act of 1700, its second section, relating to line or division fences, fell also. A careful examination of the repeal of the Act of 1700 will, however, show that its provisions are distinctly limited to the first section of the Act to be repealed; it will also be seen that the second section of the Act of 1700 was replaced by the Act of March 11, 1842, and that the later Act is the ruling law as to line or division fences. But, accepting the argument, it will be found that the ninth section of the Act of March 11, 1842, distinctly repeals the second section of the Act of 1700, and clearly supplants it by its own provisions, which are as follows (see Act of March 11, 1842):

1. That in addition to the duties now imposed upon the township auditors, they shall hereafter perform the duties hereinafter prescribed, as fence viewers. That in addition to the oath now prescribed, to be taken by the auditors, they shall annually be sworn or affirmed, to discharge their duties as such viewers, faithfully and impartially.

2. In case of death, removal or resignation of any fence viewers and auditors, so selected, the judges of the court of the proper county shall appoint a suitable person to fill the vacancy for the unexpired term of the person whose place is vacant.

3. When any two persons shall improve lands adjacent to each other, or when any person shall enclose any land adjoining to another's land already fenced in, so that any part of the first person's fence becomes a partition fence between them, in both these cases the charge of such division fence, so far as is enclosed on both sides, shall be equally borne and maintained by both parties.

4. On notice given, the said viewers shall, within five days thereafter, view and examine any line fence as aforesaid, and shall make out a certificate in writing, setting forth whether, in their opinion, the fence one has already built is sufficient, and if not, what portion of the expenses of building a new or repairing the old fence, should be borne by each party, and in such case they shall set forth the sum which in their judgment each party ought to pay to the other, in case he stall repair or build his portion of the fence, a copy of which certificate shall be delivered to each of the parties; and the said viewers shall receive the sum of one dollar for every day necessarily spent by them in the discharge of their duties, which they shall be entitled to receive from the delinquent party, or in equal sums from each as they shall decide to be just.

5. If the party who shall be delinquent in making or repairing of any fence shall not within ten days after a copy of the certificate of the viewers has been delivered to him, proceed to repair or build the said fence, and complete the same in a reasonable time, it shall be lawful for the parties aggrieved to repair or build the said fence; and he may bring suit before any justice of the peace or alderman against the delinquent party, and recover as in other actions, for work, labor, service done and materials found, and either party may appeal from the decision of the justice or alderman as in other cases.

6. The said viewers shall not be called out to view any fence between the first day of November and the first day of April of the next year.

7. If any viewer shall neglect or refuse to perform any duty herein enjoined upon him, he shall pay for each such neglect or refusal the sum of three dollars, to be recovered by the party aggrieved as debts of like amount are now recoverable.

8. A majority of the viewers of each township shall be a quorum, and shall have power to do all the duties herein assigned.

9. All laws hereby supplanted and such as are inconsistent herewith, are hereby repealed.

The recent decision in the case of Roberts vs. Sarchet, in the Chester County Courts (see Annual Report of 1893, pp. 37-40), is of special interest. The attorneys for Sarchet claimed:

"1st. That because the Act of March 11, 1842, under which these proceedings were instituted, had been repealed by the Act of April 4, 1889, or more accurately speaking, that the latter act, by repealing the first section of the Act of 1700, upon which the Act of 1842 rested and which alone gave it vitality, has annulled or rendered it inoperative.

2nd. Because the viewers neglected, prior to repairing the fence, to set forth in their certificate the sum which, in their judgment, Mr. Sarchet ought to pay for the building or repairing of his portion of the same."

In his decision, Judge Hemphill over-ruled these claims, and held that the Act of March 11, 1842, was in no wise affected by the repeal of the Act of 1700.

The fact that the Act of April 4, 1889, only refers to and repeals the first section of the Act of 1700, was also brought out in this case.

At the Somerset meeting of the Board, held in June of the present year, Frederick Jaekel, Esq'r, member of the Board from Blair county, thus explained the meaning of the Act of 1842, in answer to the question from the question box, "Does the fence law as it now stands, repeal the fence laws of 1700 and 1784?"

Mr. Jaekel answered as follows: "In olden times every man was the owner of his property, whether surrounded by fences or anything else. When the City of Rome was built, they drew a furrow around it with a plow, and any who would cross that furrow, were considered as trespassers. This was brought into England, and considered the English law, and it is today the law. This was also brought over to America in Colonial times, when there was a great deal of strife because the cattle would trespass, and a law was passed in 1700, that every man must protect his fields by building fences. It was to be six feet high, and if cattle got into the field, he had to prove, before he could get any damages, that his fence was sufficient. This was in contradiction of the opinion and common sense of all the people. Since that time, there have been laws passed concerning this question. In 1787, there was a law passed; in 1789, there was another law passed; in 1842 there was still another law passed. In 1889, there was a law passed repealing the first and second sections of the law of 1700 and 1784, so that today, no man need to build any fences, whatever. Every man who keeps stock must keep that stock in, and be responsible for it, and he is liable for damages in case it trespasses on another's land; and so we come back to the common law as it existed many years ago. I will corroborate this view by the opinion written by Justice Dean, in the case of Barber vs. Mensch, but that relates entirely to partition fences. Understand, no man need build a fence in order to keep out other people's cattle. For some time there has been some contention as to partition fences, but the opinion of Justice Dean, delivered in October, 1893, settles that question. No man is bound to keep other's cattle out, but each man is bound to take care of his own cattle, and keep them in. The first part relates to the Act of 1700 up to 1842, reviewing them and deciding that there is no fence law in existence, and that we have come back to the common law, and that no man need build a fence. Mr. Barber's property adjoined that of Mr. Mensch, in Union county; Barber made half of the fence and Mensch did not make his part; Mensch's cattle broke through that bad part of the fence and went into Barber's fields. Barber complained, and after a while, he brought suit before a justice of the peace, and the justice awarded $25.00 damages, which he had sustained by Mensch's cattle running into his field. To that award Barber appealed to the court of common pleas of Union county, and the court decided that Barber had to build his fence to keep Mensch's cattle out; he appealed from there to the Supreme Court of the State, and they decided that Barber could make the fence, but Mensch had to keep his cattle in."

In the case of Barber vs. Mensch, to which Mr. Jaekel refers, the following is found in the charge of the court: (see Penn'a State Reports, 157, pp. 390-398.)

"The contention of the plaintiff is that the Act of 1700, providing for the erection of fences about cornfields and other enclosures, and naming the kind of fence, heighth of it, and the manner of its construction, was repealed by the Act of 1889; that with that Act fell the Act of 1842, providing for the cost of maintainance and partition fences between adjoining land owners. On the other hand, the defendant contends that, while the Act of 1700 was repealed, the Act of 1842 is still in force, and that it is still necessary for land owners to keep up the partition fences. Without any Act of Assembly on the subject, at common law, a man is responsible for any damage that his cattle might do on the land of another. The Act of 1700 was intended to prevent that in this State, and from that time until 1889, it did so. The Act of 1842, we do not think was rendered null and void by the repealing Act of 1889, as contended by defendant's counsel. Between adjoining land owners, the Act of 1842 is still in force, and it is now, as it was before the Act of 1889, necessary for farmers to build partition fences and maintain them. That is the principal point which is raised in this case. Therefore, as between Mr. Barber and Mr. Mensch, this fence being a common fence, they were both bound to see that it was in repair; that is, it was the duty of each of them to keep up every part of the fence, unless there was an agreement between them that one should keep up one part and the other the other, and I believe there was no evidence of any agreement of that kind in this case."

The plaintiff's points are as follows:

1. That since the Act of April 4, 1889, no line or partition fence is required to be made between lands of adjoining owners, and no condition of any so-called line fence will excuse the defendant in the present case, if the jury believe that the defendant's cattle were without permission on plaintiff's lands. (*Refused.*)

2. That if such line or partition fence is required, the evidence shows that the plaintiff did all that he was legally required to do in relation thereto, and if the jury believe that the defendant's cattle were upon the plaintiff's land without his permission, the plaintiff is entitled to recover. (*Refused.*)

3. That since the passage of the Act of April 4, 1889, no man is required to fence against his neighbor's cattle; but every person is legally bound to restrain his own cattle. (*This point is refused as far as this case is concerned.*)

The defendant's points are as follows:

3. That a partition fence is a common burden to both parties, and both parties must build the fence; if they cannot agree, recourse must be had under the Act of Assembly of 1842, before any right of action can accrue from the condition of the fence. (*Affirmed.*)

4. That under the Act of Assembly, if the parties cannot agree, the adjoiner seeking to have the fence must build it himself and have recourse to the Act of Assembly. (*Affirmed.*)

5. That if recourse is not had to the Act of Assembly, and a fence built under it, no right of action can accrue by reason of there being no fence, neither can a right of action accrue by reason of breachy cattle if there is no such fence. (*Affirmed.*)

Taking the cases of Roberts vs. Sarchet, and Barber vs. Mensch, we draw the following conclusions as to the meaning of the Act of 1842, and the decision of the courts relating to it:—

If there is no agreement between adjacent land owners as to the maintenance and repair of definite portions of the fence, either is charged with its maintenance, and the cost should be equally borne; if either one is dissatisfied with the condition of the line fence, no agreement having been made as to the repair of certain portions by each land owner, before either one can recover damages from the other by reason of injury from cattle, it is his duty to repair *the whole fence*, proceeding under the requirements of the Act of 1842, and placing one-half the cost upon the neighbor. If he fails to do this, he cannot recover.

If, as usually is the case, there is an agrement that each party shall maintain a certain portion of the fence, then this construction will not hold good, and the party whose crops are in danger must proceed, under the Act of 1842, to have the faulty fence repaired or reconstructed, and may, after a decision from the fence viewers (auditors), collect it from his neighbor; but where there is no mutual division of the line fence, each adjoining land owner is equally responsible, and neither can assume the care of a portion of the fence, but must, under the Act of 1842, put the whole in repair before he can collect damages.

The Legislature of New York recently enacted the following:

"Section 1. Section one hundred of chapter five hundred and sixty-nine, of the laws of 1890, entitled, "An Act in relation to cows, constituting chapter twenty of the general laws, and the act amendatory thereto," is hereby amended to read as follows:

"Each owner of two adjacent tracts of land, except when they otherwise agree, shall make and maintain a just and equitable portion of the division fence between such lands.

When adjoining lands shall border upon any of the navigable lakes, streams or rivers of the State, the owners of the lands shall make and maintain the division fence between them, down to the line of low water mark, in such lakes, streams or rivers, except those lands which overflow annually, so as to be submerged with water that no permanent fence can be kept thereon, and known as low, flat lands; and when adjoining lands such as shall be bounded by a line between the banks of streams of water not navigable, and the owners or occupants thereof can not agree upon the manner in which the division fence between them shall be maintained, the fence viewers of the town shall direct upon which bank of the stream and where the division fence shall be located, and the portion to be maintained by each adjoining owner.

Section one hundred and one, of said law is hereby repealed. This Act shall take effect immediately."

Governor Flower returned this Act to the Assembly without his approval, and with the following veto message:

"For more than fifty years in this State, a land owner has not been compelled to build a division fence, if on due notice, he chooses to let his land lie open to all animals on his neighbor's land, and does not permit his animals to trespass on the lands of his neighbor. This bill proposes to abolish such privilege, and to enable one land owner to compel his neighbor to keep up a division fence, although he has no animals to trespass on his neighbor, and he has no objection to his neighbor's animals tresspassing on him.

When lands are sparsely settled and uncleared, this bill might work hardship and injustice. In the more thickly settled and closely cultivated portions of the State, both parties have usually such mutual interests in the maintenance of a division fence that neither of them will ordinarily care to let his lands lie open. In all events the advantages to be gained by this bill in the latter class of cases, do not seem sufficient to counterbalance the hardships which would result from its adoption in the former class of cases."

FEEDING WHOLE CORN.

The Kansas Experiment Station (Bulletin No. 47, for August, 1894), reports the result of careful experiments made to ascertain the comparative feeding value of dry and soaked, unground corn, when fed to steers. Two lots of five steers each were selected for the experiment; they were as nearly alike as could be obtained; both were of the same age, and cost $3.60 per hundred pounds at the time the experiment was commenced.

They were separated by a wire fence, and each lot had a shed closed upon three sides and open to the south, for shelter. In addition to the shelled corn, each lot had cornfodder, Kaffir corn fodder, oat straw, millet hay and prairie hay, each lot having the same kind of fodder at the same time, and every other precaution being used to make the experiment a fair one.

The animals were fed whole grain five times each day during the experiment, the frequent feeding being resorted to to prevent the freezing of the soaked corn. Any amount left unconsumed was carefully weighed and deducted.

In order to make the experiment perfect, and to prevent any difference on account of the imperfect digestion of the dry and soaked corn, eight shoats of 120 pounds each, were turned into each lot to consume the undigested grain, and throughout the experiment, each lot of hogs was weighed and taken into consideration in arriving at conclusions. The report states that "At first, when the steers were fed 125 pounds of dry corn per lot, the hogs found about all they could eat in the droppings; but as the steers ripened up, and hence ate less, and the hogs grew larger and demanded more, it became necessary to feed them some corn in addition, each lot receiving the same quantity, with a record of the weight."

The period of feeding extended from October 31st to November 4th, and the record of each lot of steers was as follows:

Lot fed on dry corn; total gain, 1468 pounds; average daily gain, 9.78 pounds; average daily gain per head, 1.957 pounds.

Lot fed on soaked corn; total gain of lot, 1632 pounds; average daily gain, 10.88 pounds; average daily gain per head, 2.176 pounds.

The summary of the experiment gives the following as the amounts of each kind of food consumed, and the gains per lot and per head:

Lot fed on dry shelled corn; 16,244.5 pounds of shelled corn; 2567 pounds of corn fodder; 3667 pounds of Kaffir corn fodder; 273 pounds of oat straw; 660 pounds of millet hay; 960 pounds of prairie hay; total weight of food consumed, 24,371.5 pounds.

Average consumption of food per head: Shelled corn, 3,248.9 pounds; corn fodder, 513.4 pounds; Kaffir corn fodder, 733.4 pounds; oat straw, 54.6 pounds; 132 pounds of millet hay, and 192 pounds of prairie hay; a total average per head of 4,874.3 pounds of food.

The results of the feeding were as follows: Total gain in 150 days feeding, 1,468 pounds; average gain per head in 1150 days, 293.6 pounds; average daily gain per lot in 150 days, 9.78 pounds; average daily gain per head, 1,957 pounds; total cost of feed during 150 days, $92.57; average cost of feed per head, $18.51; average cost per pound of gain, 6.3 cents; food eaten per pound of gain, 16.6 pounds.

The lot fed upon soaked corn gave the following record:

Total food eaten: Shelled corn, 15,787.5 pounds; corn fodder, 2,558 pounds; Kaffir corn fodder, 3,840 pounds; oat straw, 273 pounds; millet hay, 661 pounds; prairie hay, 1,008 pounds; total weight eaten, 24,127.5 pounds. Average food eaten per head: Shelled corn, 3,157.5 pounds; corn fodder, 511.6 pounds; Kaffir corn fodder, 768 pounds; oat straw, 54.6 pounds; millet hay, 132.2 pounds; prairie hay, 201.6; total per head, 4,825.5 pounds.

The results of the feeding for this lot were as follows:

Total gain in 150 days feeding, 1,632 pounds; average gain per head, 326.4 pounds; average daily gain of lot, 10.88 pounds; average daily gain per head, 2.176 pounds; total cost of feed, $90.613; average cost of feed per head, $18.122; average cost per pound of gain, 5.55 cents; food eaten per pound of gain, 14.78 pounds.

December 23d it was found that the droppings of the lot fed upon soaked corn amounted to 11.65 pounds (equal to) dry corn, while on the same date the droppings of the lot fed on dry corn contained 16.53 pounds (equal to) of dry corn. As the experiment progressed, the amount of dry corn in the lot which was fed the dry feed increased to 19.87 pounds to each 115 pounds of corn fed, while with the lot fed the soaked corn, the droppings contained but 13.21 pounds of corn to each 115 fed.

In the case of the lot fed dry corn, the amount of grain taken from the droppings had an actual weight, before drying, of 44.5 pounds at the close of the test, while the corn voided by those to which the dry corn was fed, weightd but 32.33 pounds.

The report of the experiment states that "these two lots of hogs present an interesting contrast. All were thrifty young hogs. The two lots weighed alike within one pound on November 16th, when they were put behind the steers, and they were placed under exactly the same conditions; yet the hogs following lot No. 2 (to which the dry corn was fed) gained 112 pounds more than those following lot No. 1, and this in 141 days feeding."

The experiment demonstrated the fact that if 100 pounds of air-dried corn was placed in a light bag and immersed in water for a moment and allowed to drain thoroughly, the corn would weigh 106.25 pounds; it was also shown that 100 pounds of similar corn soaked in water 12 hours would weigh 121.25 pounds, and that the limit appeared to be reached after 190 hours soaking, when the 100 pounds weighed 147.5 pounds.

In the summary of the experiment the following points are brought out:

1. The five steers fed on soaked corn (shelled), gained a total of 1,632 pounds in 150 days on 282 bushels of corn, while the five steers fed on dry corn gained a total of only 1,468 pounds on 290 bushels of corn.
2. The steers fed on soaked corn, owing to their better condition, brought a higher price in the market than the steers fed on dry corn. Balancing both cost of feed and market value of the two lots there is a difference of $25.50 in favor of soaking the corn.
3. The hogs following the steers fed on soaked corn made a total gain of 635 pounds, while the hogs following the dry corn steers made a total gain of 747 pounds. This makes a difference of 112 pounds in favor of the dry corn, and the market value showed a difference of $5.58 in favor of hogs following dry corn steers.
4. Based on the foregoing figures it will pay to soak corn if it can be soaked for six cents or less per bushel.

WHEAT AS STOCK FOOD.

The quarterly report of the Kansas State Board of Agriculture devotes considerable amount of space to the consideration of wheat as a stock food, and also to a comparison between it and corn. One of the writers advances the following arguments in favor of wheat:

"From a purely scientific standpoint, wheat is a more nearly perfect food for animals of all kinds than is corn, and pound for pound, produces greater gains. Corn contains too great a proportion of carbohydrates and fats, and the excess is wasted, or worse than wasted, by taxing the energies of the animal in the digestion of elements that cannot be assimilated. Its 'nutritive ratio', which is the ratio existing between the quantity of protein-muscle forming elements and the combined quantities of carbohydrates and fats, is too wide. Wheat contains a greater proportion of protein and a less proportion of carbohydrates, and, therefore, comes nearer than corn to meeting the requirements of animals. There are, however, other considerations, as of mechanical condition, militating against wheat and in favor of corn, which makes it a matter of dispute whether fed as nearly alone as grain is usually fed in this western country, corn is not, by weight, the more valuable feed. In any case, it is undisputed that it is better where wheat is fed, to make it only the basis of a ration, instead of feeding it clear, to compensate for its deficiencies by the addition of other foods, and thus 'balance' the ration."

A writer who has had a large amount of experience in feeding wheat recommends the following as safe and profitable rations:

Mixtures.	Protein.	Carbo-hydrates.	Fat.	Nutritive ratio.
Mixture No. 1.	*Pounds.*	*Pounds.*	*Pounds.*	
50 pounds corn,	3.5	31.3	2.1	
50 pounds wheat,	4.6	27.9	0.9	
100 pounds mixture,	8.1	59.2	3.0	1:8.1
Mixture No. 2.				
40 pounds wheat,	3.7	22.3	0.7	
40 pounds corn,	2.8	25.1	1.7	
20 pounds bran,	2.5	8.8	0.6	
100 pounds mixture,	9.0	56.2	3.0	1:7.0
Mixture No. 3.				
40 pounds wheat,	3.7	22.3	0.7	
20 pounds corn,	1.4	12.6	0.8	
20 pounds oats,	1.8	8.9	0.8	
20 pounds middlings,	2.4	8.4	0.6	
100 pounds mixture,	9.3	52.2	2.9	1:6.8
Mixture No. 4.				
60 pounds wheat,	5.5	33.4	1.1	
20 pounds oats,	1.8	8.9	0.8	
20 pounds middlings,	2.4	8.4	0.6	
100 pounds mixture,	9.7	50.7	2.5	1:5.3

The writer further states that the experience of himself and neighbors demonstrates that Nos. 1 and 2 are best suited for fattening animals, and Nos. 3 and 4 best for growing animals.

Prof. W. A. Henry, of the Wisconsin Experiment Station, wrote as follows in reference to the use of ground wheat as a stock food:

"As to the fine or coarse grinding of wheat, I cannot give definite information. In general, for cattle I do not see why we should grind the grain fine, since grain cracked, or slightly crushed, seems very palatable and is well liked by most feeders. I admit there is great diversity of opinion on all these points, and one can get any sort of an answer he searches for. I think wheat rolled or broken rather coarse by grinding (chop feed) will prove very satisfactory for steers, and that they will less often cloy on it than when ground into a flour, which is apt to make a pasty mass on mastication unless well mixed with bran or corn.

"I know of but a single experiment in feeding wheat to steers. Prof. Wm. Brown, of the Ontario Agricultural College, fed damaged wheat to 20-months-old steers averaging 1,030 pounds. He says: 'It was a miserably dried up, shriveled and badly damaged sample of fall wheat. Millers would not even take a present of it.' He found it required five pounds hay, twenty-three pounds roots and four and one-half pounds wheat to add one pound live weight. This is a rather small amount of feed all around for a pound of increase.

"At the Woodburn Experiment Station, England, Doctor Voelcker fed wheat three seasons to fattening sheep, in comparison with grain, oil meal and cotton-seed meal, and concluded that wheat produced the cheapest gain, at current prices for food stuffs in England.

"A number of experiments have been conducted in feeding wheat to hogs. At the Dominion Experiment Station, Ottawa, Prof. Robertson fed wheat injured by frost to hogs, with a gain varying from nine to fourteen pounds of live weight from one bushel of shrunken wheat, the larger gain from a bushel being with growing pigs, and the smaller with heavy hogs. At this station we have conducted some experiments with wheat in comparison with corn, the results of which have not yet been published. I may say, however, that a combination of wheat and corn gave a higher rate of gain with hogs than either grain fed separately.

"As to the relative merits of wheat and corn, it is hard to draw any exact comparison, for we can only compare things that are alike. For growing animals I place wheat from ten to twenty-five per cent. above corn; for simply fattening growing hogs, I doubt if it will go any further, pound for pound. A mixture of wheat and corn, ground, will make more pork than either alone, I am quite sure."

Prof. Chilcott, of the South Dakota Experiment Station, thus summarizes the results of their experiments in the use of wheat as food for hogs:

"1. Hogs averaging 100 pounds in weight can be purchased near September 1 at $4.50 per cwt., live weight, fed three months on nothing but wheat, water, ashes and salt, and an occasional handful of hay or corn fodder, butchered and sold December 1 for $5.50 per cwt., dressed, and will return from 56 to 58 cents per bushel for wheat consumed, without allowing anything for manure or labor in caring for hogs.

"2. At present prices wheat can be profitably fed as an entire ration, but it would undoubtedly pay better to mix it with some other food, particularly during the earlier stages of fattening.

"3. Hogs fed on ground wheat made a more rapid and uniform gain and produced more pork of rather better quality; but they also consumed more food than those fed upon whole wheat. Those fed ground wheat required 4.81 pounds of wheat to produce one pound of gain, while those fed whole wheat required 4.91 pounds to make the same gain. Ground wheat brought 58.39 cents per bushel, while that fed whole brought 55.83 cents per bushel, a difference of only 2.56 cents per bushel. This would hardly pay for grinding, but considering the better quality of the pork and greater weight, it would probably pay to grind, if it could be done without much extra cost.

"4. Ground wheat brought 58.39 cents, whole wheat 55.83 cents, peas 65.36 cents, and corn 60 cents per bushel, on an average, for all the grain consumed during the entire experiment, continuing for ninety days. Hogs fed on peas did much better, in proportion, during the first part of the experiment than they did during the latter part, which would indicate that peas are not as good for a complete ration for a long period as either wheat or corn.

"5. The quality of the pork made from corn and ground wheat was about equal, and was superior to that made from whole wheat, peas or mixed food. That made from mixed foods was the fattest.

"6. The average daily gain of hogs fed on peas was 1.21 pounds; on whole wheat, 1.12 pounds; on ground corn, 1.40 pounds; on ground wheat, 1.32 pounds, and on mixed foods, 1.61 pounds.

"7. This question was not settled, but it was very plainly demonstrated that a considerably larger return per bushel for food consumed would have been realized if the hogs had been sold at the end of the second period. This was particularly true of lot 1, fed on peas. The decrease in rate of gain in proportion to food consumed for those fed corn meal and wheat was no greater than could be accounted for by the natural result of increased weight and age."

Secretary Coburn, of the Kansas Board of Agriculture, after obtaining the results of practical experiments in a large proportion of the counties of the State, thus summarizes the situation as illustrated by them:

"It is superior to corn, pound for pound, as a grain to produce healthful, well-balanced growth in young animals.

Mixed with corn, oats or bran, it is much superior to either alone, for work horses.

Fed to cows, it is an exceptional milk-producer, and for that purpose corn is scarcely to be compared with it.

For swine of all ages, it is a healthful and agreeable food, giving generous returns in both framework and flesh, but fed whole, especially without soaking, is used at a disadvantage. Ground and made into slops, it is invaluable for suckling cows, and for pigs both before and after weaning.

For cattle, it has, at least as a part of their grain ration, a very high value, which is much enhanced in the line of needed variety by mixing with corn, and in a still greater degree by mixing judiciously with bran, oil cake or other albuminous foods tending to balance the carbonaceous nature of the clear wheat.

With corn and wheat approximating the same price per bushel, it is not unprofitable nor wicked to feed the wheat; yet, if it can be ground, rolled, crushed or in some way broken at a total cost not exceeding five to seven cents per bushel, to feed it whole and dry is unwise.

It can be ground at a cost of five cents per bushel, and on a majority of Kansas farms for very much less.

If grinding is impracticable, soaking from twenty-four to thirty-six hours (the length of time depending somewhat upon the weather and season) is for various reasons deemed desirable, but is injudicious to any extent that its being moist facilitates swallowing without the mastication or the proper mixing with saliva. Any arrangement or system of feeding by which the grain was delivered in such a way that the animal could eat but slowly, would largely overcome this defect.

It is a superior food for all fowls, and as a promoter of the maximum egg production, is unsurpassed by any other grain.

COTTON-SEED FEED.

During the past season quite a large amount of a mixture of ground cotton-seed hulls and cotton-seed meal have been sold in the State as a dairy food. The mixture was said to contain not less than one-fifth of cotton-seed meal, but all samples examined indicated that the proportion of pure cotton-seed meal was considerably less than the amount advertised, and that, in fact, in many cases there was barely sufficient of the meal to color the mixture, and in some cases even this appears to have been in a damaged condition.

We have taken considerable pains to obtain the views and results of practical dairymen and stock feeders who have used the mixture, and thus far none are inclined to speak favorably of the article when compared with corn-meal, bran or other stock foods then on the market; but the main difficulty in most of the answers was in the fact that but few of those who had experimented had weighed the milk or kept careful accounts of the results of their test.

Thomas J. Philips, residing near Atglen, Chester county, having a large dairy kept for the sale of milk, reports that in January he fed it and made a careful test with its milk producing value as compared with wheat and corn-meal, and with wheat bran and corn-meal; he found that with the cotton-seed feed, corn-meal and clover hay, making his ration costing him nineteen and one-half cents per cow; with wheat bran, corn-meal and clover hay, costing eighteen cents per day per cow, and wheat bran, corn-meal and clover hay, at a cost of sixteen cents per day per cow, the amount of milk, although costing more with the cotton-seed feed, did not increase in amount, and that he had arrived at the conclusion that it did not pay with corn-meal, wheat and wheat bran, compared with their present prices.

S. F. Barber, living near Harrisburg, and carrying on a large dairy for butter and cream, reports that he had made a careful experiment with cotton-seed feed and did not find it satisfactory. He reports as follows:

"After three weeks' trial, I have not been able to increase the milk flow or the percentage of butter fat. During the trial they were fed one-third coarse bran, one-third corn chop and one-third cotton-seed feed. On this feed they about held their own in milk, but lost in live weight; my usual feed costing less per day per cow, made more milk and more butter fat."

The Tennessee Experiment Station (Bulletin, Vol. VI, No. 2, for April, 1893), gives the following as a result of an extended experiment at the station:

"The result shows that thirteen pounds of cotton-seed hulls can be advantageously used to take the place of fifteen pounds of corn silage and six pounds of hay in making up a ration with three pounds of cotton-seed meal and five pounds of wheat bran, while reducing the cost about ten per cent.

"We are thoroughly convinced that, properly used, cotton-seed hulls from sound seed and free from extraneous matter, of such quality as those furnished to us for this series of experiments, are a valuable addition to our list of feed stuffs for milch cows. We can recommend as giving satisfactory results the use of as much as fifteen pounds of cotton-seed hulls in the daily ration per 1,000 pounds, live weight. A larger proportion has, with our cows, caused a weakening of the digestive powers, evidenced in some cases by a tendency to diarrhoea, and in others to constipation.

"Cotton-seed meal and cotton-seed hulls should be far more extensively used as a cattle food. These products of the cotton fields of the South will enable the farmers of Tennessee to maintain or to restore the fertility of their lands at the least cost for manures."

Prof. H. J. Waters, of the Pennsylvania Agricultural Experiment Station, gives the following as the composition of the cotton-seed feed used by them:

	Cottonseed meal.	Cottonseed hulls.	One part of meal to five of hulls.	Cottonseed feed.
Water,	8.2	10.4	10.0	7.6
Ash,	77.2	2 6	3.4	2.6
Protein,	42.3	4.0	10.4	8.3
Crude fibre,	5.6	41.4	37.9	46.0
Nitrogen-free extract,	23.3	36.6	34.4	32.6
Fat,	13.1	2.0	3.9	2.9
	100.0	100.0	100.0	100.0

In relation to the comparative proportion of cotton-seed meal and cotton-seed hulls in the feed, Prof. Waters writes as follows:

"The analysis of the cotton-seed feed would indicate that this particular sample contained less meal and more hulls than was claimed. A mixture of one part of meal to nine of hulls would have about the composition of the sample examined. It should be borne in mind, however, that the cotton-seed meal is a fine powder and might very readily sift down to the bottom of a pile of the feed, so that the sample as sent may not be a fair representation of the feed."

The report of the Pennsylvania Experiment Station compares the digestibility of cotton-seed feed with that of bran, corn, timothy hay and corn fodder, as follows:

	Bran, at $17.50.	Corn at 45 cents.	Cottonseed feed, at $15.00.	Timothy hay, at $10.00	Cured corn fodder, at $4.00.
Digestible protein,	12.0	8.1	7.1	3.1	2.5
Digestible carbohydrates,	35 6	64.8	25.0	43.3	35.1
Digestible fat,	2.9	4.7	3.5	0.9	0.6
Total,	50.5	77.9	35.6	47.3	38.2
Nutritive ratio,	1:3.5	1:9.0	1:4.6	1:'5.3	1:14.6
One pound of digestible food costs,	1.733c.	1.032c.	2.107c.	1.057c.	0.523c.

The same authority gives the comparative digestibility of cotton-seed meal, cotton-seed hulls and of two mixtures of the two, as follows:

	Cottonseed meal.	Cottonseed hulls.	One part of meal to five of hulls.	One part of meal to nine of hulls.
Digestible protein,	37.6	1.0	7.1	4.7
Digestible carbohydrates,	15.8	26.8	25.0	25.7
Digestible fat,	13.1	1.6	3.5	2.8
Total,	66.5	29.4	35.6	33.2
Nutrative ratio,	1:1.2	1:30.4	1:4.6	1:6.7

In summing up, Prof. Waters writes:

"According to the above figures, cotton-seed feed is a relative expensive feed, especially when compared with coarse fodders It seems to be very doubtful whether it is an economical feed for Northern farmers to buy. In the Southern States, where hay is often scarce and expensive and the hulls are comparatively cheap, the latter undoubtedly offer an economical substitute for coarse fodder, while the feeding value of the meal is unquestioned."

DAIRY HERDS AND DAIRY BARNS.

The experience gained by some of the owners of our larger dairy herds during the past ten years is of a nature which should lead us to pause and consider whether we may not, at least in certain directions, have gone too far for profit and for the general good health of our animals. The indications are that the theory that warmth and shelter are equivalent to food, has been carried too far, and that there is a possibility of keeping dairy stock too warm for positive profit, and that increasing the yield of the cow beyond a certain point may be followed by consequences which may rob it of all of its profit, or that in other words, the increased loss from disease may more than counter-balance the possible gain.

As an illustration, let us take the recent outbreak of tuberculosis in a large herd in Eastern Pennsylvania. Here we had one hundred cows under the most favorable conditions for the production of large amounts of milk at a minimum of cost. As they were selected with great care by a good judge of dairy stock, it would have been impossible to have found one hundred other cows in one herd anywhere in the State giving such satisfactory results in point of yield and cost of the product; they were liberally fed upon the best of food, kept in a warm barn and well cared for in every respect.

A tubercular animal was introduced into the herd without suspicion, and in a short time seventy-five per cent. of the cows were found to be infected, and were promptly killed by order of the trustees. This infection could not be charged to any predisposition to the disease, for the animals were as healthy a looking a herd as could be found anywhere, and the fact that until the introduction of this animal they had been healthy, would indicate that there was no special tendency to disease of this or any other kind, and yet within a comparatively short space of time, the damage was done and the injury beyond repair.

Measurements show that each animal had an average of about 475 cubic feet of air space, and that, at least in cold weather, the stables were made warm by the animal heat and breath of the occupants, and it is probably to this fact that the great percentage of infection was due, for it would have been difficult to have contrived a better mode of spreading a contagious disease than was here presented, and all of the surroundings of care, warmth, etc., had a tendency only to make the case worse.

This and similar instances within the experience of every veterinary surgeon in the State will serve to illustrate the point that we wish to make, viz, that there is a condition beyond which we cannot go with profit, and that if this point is passed, either by increasing the warmth of the stock, in heavy feeding and milking, or in increasing the number kept within certain limits, the danger to and the percentage of loss from disease is greatly increased.

Every flock master knows that the profit obtained from fifty sheep in one enclosure cannot be doubled by one hundred; every poultry keeper knows that the profit from fifty hens cannot be doubled, even with similar care and feed. And we are forced to admit the fact that the same reasoning holds good with our dairy stock.

We would not wish to be understood that an increase in the number of animals in one place necessarily increases their liability to disease and death, but we think that the statistics prove that this condition of affairs does practically exist, and that it is not due to the immediate fact that the numbers have been increased, but to the fact that in ninety-nine cases out of the hundred, this increase in numbers is made possible by the decrease in the amount of air space per animal; and we think that it is just here that the evil will be found, and that it is here that the remedy should be applied. When the numbers are increased, instead of decreasing the air space per animal, it should be increased; for every addition is like adding fuel to a flame; it makes the conflagration that much the more difficult to control.

John M. Parker, in a paper read before the Massachusetts Veterinary Association, uses the following language:

"Our surroundings make us what we are. If our treatment could begin with the birth of the patient, in ninety-nine per cent. of cases we should have no tuberculosis to treat. No matter about the family history. And this remark applies equally well to the dairy cow. Their surroundings make them what they are. And I venture to assert that if sanitary and hygienic conditions were what they should be, we would have little or no bovine tuberculosis in our dairy herds. It is the common, every day life that the person leads that governs his health, and it is the common every day life the dairy cow leads that governs her health and vitality. Their surroundings make them what they are.

"Sanitary science has made vast strides in the last twenty years, yet our dairy farms are in practically the same condition they were fifty years ago. In fact no effort is made on the average farm to conform to any sanitary laws or regulations whatsoever. The old, barbarous practice of confining the cow in stanchions is still in use, and the old barn and barn yard, with its strong odor and slimy filth, are still in existence.

"Sanitary science is advancing every year. Our cities are well drained, our drinking water is carefully guarded, houses and schools must have sufficient light and air, our young men and children must have exercise, and yet our dairy cattle are expected to retain their health and strength, and to maintain their vitality, shut up for months in close barns, without ventilation or fresh air, and with little light; compelled to stand in their tracks unable to move, unable to turn around even to lick their sides."

In another portion of his essay, Mr. Parker uses the following language:

"Every one knows that exercise increases the flow of blood to the muscles, and in consequence of the greater amount of waste products carried off and the greater amount of oxygen required by the system, a quickening of the heart's action and a quickening of breathing results. On the other hand, when little or no exercise is taken, the circulation becomes sluggish, the heart, like any other large muscle, degenerates for want of use. The breathing becomes shallow and the lungs are not expanded. When any extra strain is put upon them, they are not able to do their work, and we have rupture and permanent dilation of the air cells, along with weak lungs and a predisposition to pulmonary disease.

In referring to exercise I do not wish to be understood as advocating a large field or range for the cattle to run over. I do not wish to advocate anything impracticable, but I do think that the present method of confining dairy cattle with stanchions is capable of improvement. I do think they ought to be allowed their liberty, and further, I do not see anything impracticable in any such suggestion. Any condition that affects the comfort of the animals must affect their general well being."

Dr. Parker, after making a careful inspection of a large number of dairy barns and cow houses, publishes the following table, showing the actual condition of twelve taken at random:

Number.	Number of Cattle.	Cubic space for animal.	Ventilation.	Light.	Water.	Cellar.	Manure, how disposed of.
1,	7,	465,	None,	Poor,	City,	Yes.	Cellar.
2,	10,	286,	do.	do.	Spring,	No,	Outside barn.
3,	1,	440,	do.	None,	City,	do.	do.
4,	6,	224,	do.	Poor,	Spring,	do.	do.
5.	4,	143,	do.	do.	do.	do.	do.
6,	7,	800,	Stairway,	Fair,	do.	Yes,	Cellar.
7,	7,	416,	None,	Good,	Well,	do.	do.
8,	12,	487,	do.	do,	do.	do.	do
9,	19,	1,165,	Good,	Fair,	do.	do.	go.
10,	3,	266,	Poor,	Poor,	do.	do.	do.
11,	3,	1,336,	None,	Good,	Puddle,	do.	do.
12,	12,	233,	do.	do.	Spring,	do.	do.

In commenting upon the table, he writes: "You will observe that, as a rule, the cattle are far too crowded. In the city of Boston, each animal must have 1,000 cubic feet of space, and probably, with good ventilation, that may be sufficient; at any rate it is an immense improvement on many farms in other parts of the State. But even 1,000 cubic feet are altogether inadequate if there is no ventilation. What must be the condition, then, of the barns when, as in No. 5, there is only 143 cubic feet for each animal, with no ventilation? In only three farms out of the twelve, you will notice, is there any attempt made at ventilation, and even in these it is more in name than in fact. And not in a single barn that I have been in is there any provision made for the admission of fresh air."

FOOD RATIONS—THEIR QUANTITY AND EFFECT.

A careful series of experiments conducted at the State College Agricultural Experiment Station, under the supervision of Professors Waters, Caldwell and Weld, enabled them to draw the following conclusions as to the effect of increasing the rations of cows:

1. When the average cost of the food consumed per cow per day was 19.9 cents, an increase of 2.5 cents in the cost of the ration pro-

duced an increase in the value of the butter product 3.6 cents, or a net gain of 1.1 cents per cow, amounting to 27.2 cents per day for a herd of 25 cows, or $72.50 per year.

2. A further increase of 2.7 cents per day, making the ration cost 25.1 cents, showed no increase in the butter product, and was therefore fed at a loss.

3. At this point a reduction in the daily cost of the food consumed to 20.1 cents per cow, showed a net gain in the daily profit returned of 3.5 cents over the period when the ration cost 25.1 cents, amounting to $262.50 per year for a herd of 25 cows.

4. A further reduction of 3 cents per day in the cost of the ration, making the average cost 17.1 cents, gave the smallest profit of any period in the experiment, amounting to a loss of 6.3 cents per cow when compared with the ration costing 20 cents, and 7.4 cents per day in comparison with a ration costing 22.4 cents. This means a yearly loss on 25 cows, when compared with the ration costing 20.1 cents, of $472.50, and $555.00 when compared with the ration costing 22.4 cents per day.

5. It does not appear to be profitable in the average case to increase the food of animals as long as they continue to show an increase in the butter produced, for beyond a certain limit, which varies with different animals, the increased product is made at a greatly increased cost of food.

6. While there is danger of loss from over-feeding, as is shown by the results in period III, there is a very much greater probability of a loss occurrring from under-feeding in ordinary practice, since the most profitable rations in our trials were nearly up to the limit of the appetites of the animals when the consumption of any considerable quantity of coarse fodder was required of them.

7. Wide differences are shown in the yearly profit returned by animals producing approximately the same amount of milk and butter. The extremes in ten animals used in this trial are as 1 is to 1.95

8. The ration giving us the greatest daily profit is lighter in digestible nutrients than recommended by Wolff and that found to be the average of a number of leading dairymen in Wisconsin, but agrees in details quite closely with the American standard proposed by Prof. Henry.

In this experiment the grain ration was composed of corn meal, 54.5; wheat bran, 27.3, and linseed meal, 18.2, by weight; at the commencement of the experiment each cow was given 8 pounds of the grain ration, and 12 pounds of timothy hay; this ration was gradually increased, the comparative ration between the grain and hay being carefully preserved until the twenty-fourth day of the experiment, when each animal was eating 12 pounds of the grain ration and 18 pounds of hay daily; the ration was still further increased, although that of the twenty-fourth day was fully up to the capacity of some of the cows, until at the sixty-fourth day, some of the best feeders were eating 19 pounds of the grain ration and 27 pounds of hay. From this point the daily ration was gradually decreased to the point at which it commenced.

In order to reduce the chances of error to a minimum, the term of the experiment (101 days) was divided into five divisions, two of which were at a time when the food was being increased, two of them when it was being diminished and one when the largest amount was being given. The average of each period was as follows:

1st period, ... 24 days: Grain, 10.7 lbs.; hay, 14.5 lbs.
2d period, ... 21 days: Grain, 13.0 lbs.; hay, 15.9 lbs.
3d period, ... 32 days: Grain, 15.1 lbs.; hay, 15.1 lbs.
4th period, ... 14 days: Grain, 12.2 lbs.; hay, 14.9 lbs.
5th period, ... 10 days: Grain, 8.5 lbs.; hay, 12.8 lbs.

In reviewing the results of this feeding experiment, Prof. Waters uses the following language:

"In other words, an average daily profit of 9.7 cents was given in Period I when the cost of food was 19.9 cents per day.

An increase of 2.5 cents in the cost of food consumed, making the daily ration worth 22.4 cents, returned an increase in the value of the butter of 3.6 cents in Period II, or a net increase of 1.1 cent per day per cow.

On a herd of 25 cows in milk, 300 days, this amounts to 27.2 cents per day or $72.50 per year. In Period III a further increase in the quantity of food consumed, amounting to 2.7 cents per day caused a loss of 4.7 cents per cow per day or $1.17 per day and $352.50 per year on 25 cows, when compared with Period II. When compared with Period I, this is a loss of 3.7 cents per day per cow, amounting to 92.5 cents per day and $277.50 per year in the herd named.

In Period IV, covering fourteen days, the ration had been reduced to an average daily cost of 20.1 cents, resulting in an increase in the net profit of 3.5 cents. This would return a yearly profit of $262.50 over that used in Period III on the herd above described. A further reduction in the ration was made in Period V, covering ten days, bringing the ration down to an average daily cost of 17.1 cents per cow, from which was returned the smallest net profit of any period in the experiment, involving a loss of 6.3 cents per cow per day or for 25 cows a loss of $1.57 per day or $472.50 per year when compared with Period V.

In Periods III and V we have the extremes of heavy and light feeding, so far as this trial is involved, and find by a comparison of the results a net profit amounting to 2.8 cents per day per cow or $192.00 per year from 25 cows, to the credit of heavy feeding. In other words, heavy feeding proved very much more economical and profitable than the ration costing 17 cents per day, but fell far short of returning as much profit as two intermediate rations. The loss from using the lightest ration in a year with 25 cows, compared with Period II, amounts to $562.50.

In order to test the comparative profit of well balanced and poorly balanced rations for feeding cattle, the Maryland Experiment Station (Bulletin No. 22, September, 1893), divided a lot of eight steers into two lots of four each, and gave one lot a well balanced feeding ration and to the other gave grain, hay and fodder in the usual manner; the grain ration was composed of corn and cob meal, 15 parts, cotton-seed meal, 4 parts, and bran, 2 parts; 5 pounds of cut turnips and a half pint of molasses (as a condiment) was given both lots. It was found that the lot fed on a poorly balanced ration did not relish the molasses during the latter half of the experiment, and it was discontinued entirely.

A partial result of the experiment is given in the following condensed form in the bulletin quoted:

Showing Total Gains and Average Daily Gains Made in Periods of Four Weeks.

PERIOD.		LOT 1.	LOT 2.
1.	Gain made during first four weeks,	93.00 pounds,	9.00 pounds.
	Average daily gain, during first four weeks,	3.32 do.	0.32 do.
	Average daily gain per steer,	0.83 do.	0.08 do.
2.	Gain made during second four weeks,	529.00 do.	315.00 do.
	Average daily gain during second four weeks,	18.89 do.	11 25 do.
	Average daily gain per steer,	4.72 do.	2.81 do.
3.	Gain made during last five weeks,	223.00 do.	162.00 do.
	Average daily gain during last five weeks,	6 31 do.	4.63 do.
	Average daily gain per steer,	1.58 do.	1.15 do.
	Average daily gain per steer during ninety days,	2.78 do.	1.70 do.

Prof. Miller calls attention to the fact that the greatest amount of gain appears to have been during the second period, when the daily gain per steer (for 28 days), was nearly four and three-quarter pounds, or at the rate of 142 pounds per month.

The amount and cost of the food consumed is shown in the following table:

Total Amount of Feed Used and Cost of Same.

Lot 1, Balanced Ration.			Lot 2, Poorly Balanced Ration.		
Kind of Food.	Pounds of food eaten.	Cost of food.	Kind of food.	Pounds of food eaten.	Cost of food.
Corn and cob meal,	3,372	$25 79	Corn and cob meal,	3,930	$29 47
Cottonseed meal,	899	13 26	. . . .	. . . . . .	. . . . . .
Wheat bran,	449	4 16	. . . .	. . . . . .	. . . . . .
Corn fodder,	4,392	5 49	Corn fodder,	4,144	5 18
. . . .	. . . . . .	. . . . . .	. . . .	. . . . . .	. . . . . .
Turnips,	3,360	5 04	Turnips,	3,360	5 04
Molasses,	22½ gal	5 40	Molasses,	12 gal.	2 88
Total,	12,472	$69 14	Total,	12,434	$42 57

Prof. Miller, in drawing conclusions from this table, writes as follows:

"It will be seen that Lot 1 consumed nearly eight hundred pounds more grain, and two hundred pounds more fodder, than Lot 2, on an average of 8.8 pounds of grain, and 2.7 of fodder per day. But it was most noticeable throughout the test that the steers receiving the well balanced ration were the most ready for their feed, eating it with great apparent relish, and it was an unusual occurrence for any of them to leave any unconsumed, while the lot fed on the plain diet had to be constantly watched for fear of over-feeding them."

In relation to the amount of water consumed by each, Prof. Miller makes the following statement. 1st. "Throughout the test, it was very apparent the greater amount of water consumed by Lot 1, which was a natural consequence from the larger amount of grain and fodder eaten. As a sequence, we find that on weighing sections of each pile of manure, and approximating the amount, there was fifty per cent. more made from Lot 1 than from Lot 2. Besides the greater quantity made, the fact is to be mentioned that it is much richer in plant food."

The comparative profit upon the two lots is thus given:

Profit and Loss Account of Lots 1 aud 2, is as Follows:

	Lot 1.	Lot 2.
To first cost of steers,	$154 21	$153 66
To corn and cob meal eaten,	25 29	29 4
To cottonseed meal eaten,	13 26	....
To wheat bran eaten,	4 16	....
To corn fodder eaten,	5 49	5 18
To turnips eaten,	5 04	5 04
To molasses eaten,	5 40	2 88
To feed eaten, preliminary period,	12 00	10 00
Total,	$224 85	$206 23
CR.		
By amount received on selling,	$264 24	$217 37
Profit,	39 39	11 14

From the general results of the experiment, Prof. Miller draws the following conclusions:

1. For fattening steers, a well balanced ration is very much more profitable than a poorly balanced one.
2. Steers fed on well balanced rations made an average daily gain of 2.78 pounds; those given a poorly balanced ration made an average daily gain of 1.7 pounds.
3. The increased profits from this test, show a difference of $7.06 per steer, in favor of the well balanced ration.
4. With a well balanced ration, ninety days is ample time in which to prepare an animal for market.
5. Where the more nitrogenous foods are used, it is believed nearly as good daily gains can be made by mixing the grain with corn fodder, as though hay were used.
6. The use of cut corn-fodder, instead of hay in feeding cattle, may make the difference of a profit instead of a loss.
7. Fifty per cent. more manure was made from the animals receiving the well balanced ration than those receiving a poorly balanced ration.
8. The manure is also much richer in plant food.

THE PERCENTAGE OF GLUTEN IN WHEAT.

Inasmuch as the bread making qualities of a sample of flour are largely dependent upon the percentage of gluten which it contains, some ready method of determining this percentage becomes important. A French inventor has constructed an instrument, called an aleurometer, which is thus described:

"The object of the aleurometer is to measure the elasticity of gluten.

It is composed of a hollow upper tube having at its lower extremity a moveable cap, at the other end a small piston and scale. The piston, drawn its full length from the tube, shows twenty five marks or divisions. The first of these marks is numbered 25. The space between the cap at the bottom of the tube and the piston corresponds to twenty five divisions, making the total interior length of the instrument equivalent to the fifty divisions of the scale. This, properly speaking, is the aleurometer, and may be used by bakers as it is, in their ovens. But that it may be used by others, the following described addition has been made:

Upon a copper stove, heated by an alcohol lamp, rests a copper base enclosed by a cover, in the centre of which is soldered a cylindrical tube. This copper base must be filled with sufficient oil (any oil not explosive will suffice, neats-foot oil preferred) to completely submerge the tube. Light the lamp and introduce the thermometer in the copper tube. Allow the temperature to rise until the thermometer indicates a temperature of 150 degrees C. Then remove the instrument and introduce the aleurometer in its place, having beforehand placed the gluten in the little cap at the bottom of the tube. The lamp is allowed to burn ten minutes longer and is then extinguished. Ten minutes after, the gluten is removed from the aleurometer after noting the number of marks in the scale. During this operation, the gluten, under the influence of the water which is reduced to vapor, expands and moulds itself in the cylinder of the aleurometer. In its development it rises through the empty space of 25 degrees, which separates it from the piston and by its expansive force lifts the latter so that we take from the aleurometer a cylinder of gluten which represents exactly a skeleton of the loaf of bread it will make. If the gluten does not rise as high as the piston, and in consequence does not dilate as much as 25 degrees, it should be considered as unfit for making bread.

In this test the gluten is obtained from a dough made of thirty grammes flour and fifteen grammes water, by washing in a basin of water and then under a jet of water, thus removing all starch. The gluten remaining is squeezed and compressed to remove all excess of water. A piece weighing seven grammes, first rolled in starch to prevent it from adhering to any object, is used in the attached directions."

A table showing the results of the test of nineteen samples, made by F. S. Johnson, of the Nebraska Millers' Association, gives the percentage of gluten ranging from a minimum of 10.08 per cent. to a maximum of 20.40 per cent.

A summary of the results of the analyses of 147 samples of wheat by the Department of Agriculture, at Washington, gives the following data:

	Average.	*Highest.*	*Lowest.*
Atlantic States,	11.57	12.78	10.33
Middle States,	12.86	16.10	10.68
Western States,	12.71	18.03	8.93
Manitoba,	14.53	15.58	13.48
Pacific States,	13.49	12.78	7.70

The analyses and examination of a large number of samples by McDougall Bros., in London, gave the following average results:

British India flour, 8 samples, average of gluten, 10.50 per cent.

Russia wheat flour, 4 samples, average of gluten, 19.63 per cent.

English wheat flour, 2 samples, average of gluten, 11.00 per cent.

Egyptian wheat flour, 4 samples, average of gluten, 11.60 per cent.
Australian wheat flour, 2 samples, average of gluten, 11.90 per cent.
New Zealand wheat, 2 samples, average of gluten, 9.60 per cent.
California wheat flour, 2 samples, average of gluten, 9.60 per cent.
American winter wheat flour, 2 samples, average of gluten, 11.37 per cent.
American spring wheat flour, 2 samples, average of gluten, 14.95 per cent.

CRIMSON OR SCARLET CLOVER.

(*Trifolium Incarnatum.*)

The correspondence which has reached the Department during the past year indicates that Pennsylvania farmers are taking more than usual interest in this "catch crop," which, while it possesses many of the advantages of the common red clover, also has special advantages of its own.

Calvin Cooper, member of the Board from Lancaster county, in reply to a request for information as to his experience with this crop, replies as follows:

"My first planting of Crimson Clover was two years ago, or about July 15th to 20th, 1892; it was sown among corn after the last cultivation; came up in about seven to eight days where there was sufficient moisture; balance of season warm and dry; many of the plants perished. About the first week in September, I took out a block of early potatoes; immediately harrowed and sowed on the surface, and rolled; this came up well; lower part of patch was a clayey bank, too dry, and hard to get in good order, and the set was thin on the ground; sowed about fifteen pounds per acre. Ground should be thoroughly pulverized, and with sufficient moisture during the first three weeks after sowing, it will take care of itself with half a chance.

The following spring it began blooming about the middle of May, and where the plants were thick enough to cover the ground, it was the most beautiful grass crop I ever saw, making a mass of long, crimson heads, gorgeous to behold. By the first week in June, it was fit to cut for hay, but I left it stand four or five days to harden the seed, and thereby re-seeded the ground from what shelled out in removing the hay, and produced a fair crop to plow down as green manure this spring.

After removing the hay, the ground was plowed, cultivated and planted to fodder corn, in rows about fourteen to fifteen inches apart, and had no cultivation; in this the clover came up thickly, and was about one foot high when the corn was cut, about October 1, last year, and notwithstanding the corn and clover were cut with a scythe, the clover made a good stand this spring. About the last week in April, when it was beginning to bloom, we plowed it down, by dragging it with a jointer and chain, as a green manure crop and planted corn about three feet apart in the rows, and doubled the quantity of corn for fodder. Today (July 23), the corn is higher than the head where the clover was, and about two fet shorter where no clover was plowed in; otherwise the ground was equally good. Had we not cultivated the present corn crop, we would have had some clover again, it having lived in the ground all winter, and was brought up by the plow this spring and germinated.

It should be sown thickly and cut when in full bloom, for hay; if left to ripen on the stalk, it is quite hard and woody, though stock ate it very well. From present appearances, the indications are that it is a valuable manurial crop."

J. W. Kerr, of Maryland, writes: "This plant stools remarkably well, for I got fifty-one stems from one root. On a part of my peach orchard I used 600 pounds per acre of high grade prosphate, and on the other turned under a crop of Scarlet clover. At first, the trees fed with phosphate seemed to be doing the best, but later in the season, it was the reverse, and at the end, the clover proved superior to the phosphate. The trees where the fertilizer was used ceased to grow about the first of August, and at that time the others were doing their best, the latter remaining green and ripening wood perfectly, while those where the fertilizer was used, turned yellow and were defoliated.

The great advantage of the scarlet over the red clover is that it can be sown in the summer after cultivation of the orchard and cornfield ceases, and will produce a crop by May 1st, while red clover would not make much progress by that time. Some leave part of the clover go to seed, and then, by cross-harrowing, reseed the ground. I prefer to sow eight to ten pounds to the acre, broadcast and drag it in."

Dr. A. T. Neal, of the Delaware Experiment Station, writes: "By careful analysis, we found the scarlet clover when plowed under contained fertilizing elements to the value of $25.00 per acre; $18.00 worth of this is nitrogen. The clover sent its roots down four feet into the soil and gathered part of its food from that depth."

At the New Jersey Experiment Station the following conclusions were drawn from their experiments:

1. Crimson clover is an annual plant, hardy for the whole State; it has been successfully grown in every county from Cape May to Sussex. It is adapted for a wide variety of conditions, both in reference to character of the soil, and method and time of seeding.

2. Its best use is probably derived when seeded in the summer or fall for an early spring crop, either for pasture, forage or green crop. The time of planting may extend from July 15th to September 15th, depending upon the character of the season and seed bed; good results have been secured when seeded later than September 15th.

3. Crimson clover may be seeded in orchards, berry patches, corn, tomatoes, etc., and upon new ground following after tomatoes, potatoes, melons and other crops harvested before September, but it is not adapted for seeding with wheat or rye.

4. This crop, in common with all other farm crops, requires good soils for its best development, though it is well adapted for light lands, catching readily and growing well where red clover will not thrive, and also making use of the mineral constituents not available to cereals. The average yield secured from a full stand, on May 24th, and representing soils of a different character, was 15.75 tons of green clover per acre, or equivalent to 2.7 tons of dry hay. It is believed

that this fairly represents the yield that may be secured under favorable conditions, though very much larger yields have been reported.

5. Regarded as a green manure, particularly as furnishing nitrogen derived from the air, this crop possesses many advantages due to its time of growth and development. A crop six inches high, April 24th, showed an accumulation of nitrogen in the whole plant at the rate of 104 pounds per acre, an amount equivalent to that contained in ten tons of city manure, or 648 pounds of nitrate of soda, costing $15.00. On May 12th, a crop averaging 13 inches high, which in many sections can be utilized as manure for late potatoes, corn, and orchards, contained nitrogen at the rate of 168 pounds per acre, worth $25.50. The plant at maturity showed nitrogen at the rate of 200 pounds per acre, or an amount equivalent to that contained in 20 tons of city manure, which would cost, in that form, $30.00.

6. This plant provides good pasture before other crops are available. An early pasture is not only valuable for the food contained in it, but also because it helps to insure proper feeding and to prevent too early use of other and later pastures. It was pastured this year, in central New Jersey, as early as April 10th. The crop when six inches high contained over 1,300 pounds of digestible food per acre, sufficient to properly nourish twelve cows for one week.

7. Crimson clover in average seasons, provides a soiling crop excellent both in yield and quality of product; it is satisfactory for the purpose for about twenty days, and at a time when other forage crops are not abundant. The composition and digestibility of this plant show it to be superior to red clover, and when seasons are favorable for early haymaking, the product thus secured is not excelled by any of our farm crops as a feed for all purposes."

The Delaware Experiment Station at Newark, reports as follows in relation to the growth of this crop:

"Seed of crimson clover, costing one dollar per acre, was sown in a corn field near Newark, in 1891, immediately after the last cultivation of the crop. The clover passed out of blossom during the first week of June, 1892. A test made at that time indicated that the green crop then standing, weighed 8 tons, 600 pounds per acre. It was plowed under on the 5th instant; Mastodon seed corn was planted on the 7th. An adjoining plat upon which tomatoes had been grown in 1891, and upon which no clover had been seeded for many years, was also planted with the same variety of corn on the 7th instant. A portion of this corn on the tomato plat was top-dressed with nitrate of soda, 100 pounds per acre, costing $1.00. The tomato plat yielded 24 bushels of shelled corn per acre, the tomato plat with nitrate of soda yielded 30 bushels, and the plat manured with crimson clover yielded 48 bushels.

Eight tons, 600 pounds of crimson clover, from seed which cost $1.00 per acre added 24 bushels to the corn crop. One dollar invested in nitrate of soda and used as a top-dressing added 6 bushels to the corn crop. Hence, in this case, $1.00 invested in clover seed returned four times as much as $1.00 invested in nitrate of soda. As to the relative amount of labor involved, the sowing of the seed and the broadcasting of the nitrate possibly balance each other. Plowing down a green crop is doubtless far more costly than plowing bare ground. This drawback may reduce the above named apparent gain by approximately 25 per cent."

THE BABCOCK TEST, VERSUS THE CHURN.

At a number of Farmers' Institutes held by the Board during the past winter, practical illustrations were given of the working of the Babcock Testing Machines, operated by an expert; in several cases the question arose as to why the churn, carefully manipulated, would sometimes give better results in pounds of marketable butter than the Babcock machine. The answer usually given was that butter, as placed upon the market, contained more or less butter milk, water and salt, whereas the fat as shown by the machine was pure and free from all admixture of anything but butter-fat.

In this connection it is well to remember that in many cases, possibly a majority of those in which the usual farm practice of separating the cream is followed, the churn test will fall below that of the Babcock machine, and that it is only where the closest attention to the rules governing the separation of the cream is given that the churn will exceed the test in its butter yields. It is perfectly safe to say that in a majority of cases of farmers, dairies, taken as they are found, the churn test will not come up to that shown by the machine, mainly, because all the cream has not been removed from the milk. If in such case the Babcock test is applied to the milk before the cream is raised, and to the butter milk and skim milk, and the latter added to the butter yield as shown by the churn, the variation will be found to be very slight.

Prof. Farrington, of the Illinois Experiment Station, thus shows the real difference between the two tests:

"An illustration of both a gain and a loss of butter, as compared with the butter fat contained in the milk, is shown in the following record of two churnings. A Babcock test of 380 pounds milk showed that it contained 4.9 per cent. butter fat, or 380× .049=18.6 pounds butter fat. When this milk was skimmed there was obtained 283 pounds skimmed milk, which tested 0.35 per cent. fat, or one pound fat left in the skim milk; and 97 pounds of cream which tested 18.15 per cent. of fat, or 17.6 pounds fat in cream (97.×.1815=17.6 pounds). By churning this 97 pounds cream there was obtained 21 pounds of butter and 76 pounds buttermilk. This 21 pounds butter is 2.4 pounds, of 13.2 per cent. more butter than the 18.6 pounds butter fat which the milk contained. The butter contained 83 per cent. fat, or in 21 pounds butter 17.5 pounds fat. The 76 pounds buttermilk tested 0.1 per cent. fat. 76×.001=.07 pounds fat. The 18.6 pounds fat in the milk is thus all accounted for by the weight and test of the skim milk, buttermilk and butter. 1.+.07+17.5=18.57 pounds fat. There was left in the skim and buttermilk 1.07 pounds of fat, but the butter held 3.5 pounds water and curd, so that 21 pounds butter was obtained from milk which the Babcock test showed 18.6 pounds fat. In this case the churn gave 13.2 per cent. more butter than there was butter fat in the milk. Another record was as follows:

Milk, . . . 454 pounds × .043 (test 4.3 per cent. fat)=19.5 pounds fat.
Skim milk, 361 pounds × .004 (test 0.4 per cent. fat)= 1.44 pounds fat.
Cream, . . 98 pounds × .194 (test 19.4 per cent. fat)=18.04 pounds fat.

When this cream was churned there was obtained 17.5 pounds butter and 75.5 pounds buttermilk.

This butter, 17.5 pounds × .790 (test 79.0 per cent fat) = 13.83 pounds fat.
Buttermilk, 75.5 pounds × .053 (test 5.3 per cent. fat) = 4.00 pounds fat.

The 17.5 pounds butter obtained in this churning was two pounds less than the 19.5 pounds butter fat in the milk. This two pounds loss is about 10.25 per cent. of the 19.5 pounds fat in the milk. In this case the churn gave 10.25 per cent. less butter than there was butter fat in the milk. The records of these two lots of milk show what variations there may be in practice between the amount of butter obtained by the churn and the butter fat in the milk, as indicated by the Babcock test.

The loss of butter in the second of these two trials, was in the buttermilk. The cause of this loss was the temperature of churning and the sweetness of the cream when it was churned. These complete accounts kept of the milk from the time it left the cow until the butter and buttermilk were weighed, furnish evidence to show the practical accuracy of the Babcock test. By weighing and testing the milk, skim milk, buttermilk and butter, the butter fat found in the last three should be, theoretically, just equal to that found in the milk from which they were derived. If the method of testing any of the milks was inaccurate, it is evident the two sides of the account would not balance. The figures from these two trials show the following:

First Trial.—Pounds of Fat.		
387 pounds milk	=18.6	
283 pounds skim milk		= 1.00
76 pounds buttermilk		= 0.07
21 pounds butter		=17.50
	18.6	18.57

Second Trial.—Pounds of Fat.		
454 pounds milk	=19.5	
361 pounds skim milk		= 1.44
75.5 pounds buttermilk		= 4.00
17.5 pounds butter		=13.83
	19.5	19.27

In these two accounts, the difference, which is .03 pound in the first and .23 pound fat in the second trial, is the amount of fat that is lost by the necessary manipulations in skimming and churning. It is called the mechanical loss. A daily account like this was kept with the milk of each breed at the World's Fair dairy test. The writer has a record of 312 of these balance sheets. The average weight of fat unaccounted for daily was, in the records of the Jersey milk 0.043; Guernsey 0.054; and Shorthorn 0.052 per cent. of the milk produced per day in the ninety-day test.

The memorandum of these churnings shows two things: First, that the Babcock test is a very accurate method of estimating butter fat. Second, that cream can be, and probably often is, so handled that the churn yields butter all the way from one-tenth less to about one-eighth more than the test shows butter fat."

We have several times during the past season received inquiries as to the appearance of "black material," or of "white curd," in the test glasses after the application of the acid and a partial separation of the butter fat. While the appearance of these impediments to a correct result are not yet fully explained, enough is known to show that if the dark material is thrown up, the acid is too strong, and that if the white or curdy matter, it shows that the acid is too weak.

Prof. Farrington, of the Illinois Experiment Station, writes thus in relation to these difficulties:

"It is my opinion that returning the supply of acid to the party from whom it was bought, is often unnecessary. Any person who has trouble from either the black or white substance separating with the fat, can probably remedy the difficulty by some changes in the manipulation, provided the acid is anywhere between 1.82 and 1.83 specific gravity at 60 degrees, F. The black substance that appears is probably charred fat, and indicates too strong an action of the acid on the milk. The white adulterant of the fat shows too weak reaction, or an incomplete separation by the centrifuge. Each of these defects, can, of course, be produced by acid either very much too strong or too weak. They can also be brought out by different manipulation when the acid having the correct strength is used."

In order that such results may be avoided, Prof. Farrington has formulated a series of rules with which to govern every process in the operation of the Babcock test, from which we condense the following:

First. An acid having 1.82 specific gravity should be used with milk at 60 degrees to 70 degrees F. If the acid is stronger, cool the milk to a lower temperature. Somewhat weaker acid can probably be made to work all right by warming the milk.

Second. When measuring the acid into the test bottles, hold the bottle at an angle that will cause the acid to follow the inside walls to the bottom of the bottle and not drop through the milk in the centre of the bottle. If properly poured into the test bottle, there will be a distinct layer of milk and acid with little or no black color between them.

Third. Thoroughly mix the milk and acid as soon as measured into the test bottle. A better separation of fat is obtained by mixing at once than by allowing the two liquids to stand unmixed in the bottle until enough tests have been measured out to fill the centrifuge.

Fourth. After five minutes whirling of the test bottles in the centrifuge, add hot water until the test bottle is filled up to the neck only; run the centrifuge another minute. Adding the necessary hot water in two portions is often a great help in getting a clear separation of fat. When the test bottles are taken from the centrifuge they are put into the water at 140 degrees to 160 degrees F., and the per cent. of fat read at that temperature.

Fifth. Too low results will be obtained if the centrifuge does not have sufficient speed. The machines have to be watched, as constant use wears some of them so that the speed designed by the manufacturer is not obtained.

Sixth. When testing skim milks or buttermilks which have a very small per cent. of fat—two tenths of one per cent. or less—the reading of the per cent. of fat should be made immediately on taking the test bottle from the centrifuge. If this is not done, and the test bottle cools before taking the reading, the contraction of the liquid in the bottle will often leave the fat spread over the inside surface of the measuring tube so that it is not seen, but has the appearance of being only a dirty tube. If read when taken from the machine, the small fat globules can be seen and estimated.

THE ARTIFICIAL RIPENING OF CREAM.

Nearly all of our best butter makers admit that the best flavor can only be obtained after the cream has gone through a sort of indefinitely understood process known as ripening; and it is generally supposed that the acidity of the milk or cream, or of both, has something to do with this ripening process. It is also generally admitted that this process of ripening, if carried beyond a certain point, will injure the flavor of the product. These and many other facts connected with the ripening process were known and admitted, but no definite reason was given for their existence.

For the purpose of showing that this ripening process is due to the action of bacteria, Prof. Conn, in the reports of the Storrs' Experiment Station (Bulletin No. 12), gives an interesting report, showing the results of careful experiments made by him, not only with bacteria in general for ripening the cream, but also the results of the action of certain kinds of bacteria used time after time.

In this report, Prof. Conn writes as follows:

"The butter aroma appears in the butter as the result of the ripening process. Sweet cream butter does not have the delicate flavor, and while there is a demand in our markets, perhaps a growing demand, for a sweet cream butter, it never develops the delicate flavor known as the butter cream. During ripening, certain changes take place in the cream, some of which we understand, and others which are at present beyond the reach of chemical knowledge. The composition of cream is essentially the same as that of milk, except in the higher proportion of fat. It is made up chiefly of butterfat in the form of globules, of casein in a partial suspension in the liquid, of milk sugar in solution, and of a small amount of albumen, probably in solution and partly in the form of an extremely delicate network of fibers which we call fibrin. Cream always contains a large number of bacteria, yeasts and moulds, which are active agents in ripening. These sources of micro-organism are varied. They are not present in the milk when secreted by the cow, but find their way into it in a variety of ways. Some come from the hairs of the cows; some from the dust of the bran; some from the hands of the milker; some from the milk vessels, and others, from other sources of contamination. The chances of contamination are sufficient to stock the milk with an abundance of these organisms under all circumstances. By the time the cream has reached the creamery, it contains a quantity of organism, varying widely in temperature and other conditions, and it is to these that the subsequent ripening is due."

After referring to the fact that these micro-organisms multiply best under a temperature of from 68 to 70 degrees, Prof. Conn thus follows up the process of ripening:

"During the period of ripening, the organisms are growing and producing profound changes in the cream. Bacteria are primarily destructive agents. During their growth they are pulling to pieces some of the chemical compounds of the cream and reducing them to a condition of greater simplicity, giving rise in this way to a great number of so-called decomposition products. Chemistry has not yet explained all of these changes. A few of them we partially understand. We know that some of the organisms act upon milk sugar, converting it into lactic acid, with the production of carbonic acid gas as a by-product. We know, also, that sometimes butyric acid is produced, and that sometimes ferments, similar to rennet and trypsin, make their appearance in ripening cream. Alcohol is also a common product, so much so that the butter flavor has sometimes been attributed to this product alone. We know, moreover, that the decomposition products of albumen are numerous, but we have at present practically no chemical knowledge of the methods of the albumen decomposition, or of the chemical nature of the products. These products of decomposition readily make themselves known to us through the senses of taste and smell. If the decomposition is allowed to continue long enough the products are extremely unpleasant to these two senses. An over-ripened cream gives us a strong suggestion of putrefaction and decay, and the resulting butter is poor. The earlier products of decomposition, however, do not show these unpleasant flavors, but, on the contrary, are delicate and delightful, both to taste and smell. Indeed, these decomposition products give the desirable flavor of butter. It is the purpose of the butter maker to stop the ripening at just the right period, after the proper decomposition products have made their appearance, and before they have broken to pieces enough to reach the condition of putrefaction and decay. The cream is, therefore, churned at an early stage in the ripening, and the products of decomposition give the aroma that the butter maker is searching after. These products of decomposition are probably largely due to the decomposition of the albunmen. The milk sugar plays probably no part except in the production of the acid taste in the butter, but whether the decomposition of the casein enters into the composition of the butter flavor is not yet known. If the flavor is due to the albumen decomposition, it will follow that cream should be differently treated in accordance with the amount of this product that it contains. Cream separated by the centrifugal contains less of the albuminoid material, and hence requires a different treatment in ripening from gravity cream."

In conducting his experiment, Prof. Conn found that a temperature of about 155 degrees would effectually kill all the bacteria in the cream, and that for successful culture and artificial ripening, a temperature of about 95 degrees was the highest that could be safely given. He found that, under the influence of certain bacteria, the cream would be sour; in other cases, sweet; in some cases it would be bitter, and in others, pleasant; in fact, he found, that all of these changes and effects were due to certain classes or species of bacteria, and that each species was capable of artificial culture, and when introduced into cream under the proper conditions of temperature and surroundings, would produce certain results as to flavor, condition, etc., and that the flavor of the product was at least, in a great measure, under the control of the experimentor, who, by a careful selection, could produce, within certain ranges, any effect desired.

Prof. Conn thus summarizes the results of his experiments:

"The chief object of the ripening of cream is to produce the butter aroma, and this aroma, though very evanescent, controls the price of the butter.

This flavor the butter maker owes to the bacteria; for by their growth the materials in the cream are decomposed, and the compounds formed which produce the flavors and odors of high quality butter.

Different species of bacteria vary much as to the flavors which they produce, some giving rise to good, some to extra fine and others to a very poor quality of butter. A majority of our common dairy species produce good, but not the highest quality of butter.

Up to the present time the butter maker has had no means of controlling the species in his cream, but has had to use those furnished him by the farmer.

The bacteriologist can isolate and obtain in pure cultures the species of bacteria which produce the best flavored butter. He can then furnish them to the creameries to use as starters in cream ripening. This artificial ripening of cream promises much for the near future, although it has been applied only on a small scale at the present time. The use of a pure culture of a species from Uruguay improved the flavor of the butter of a Connecticut creamery over twenty per cent., according to expert estimates.

Most species of bacteria in bad butter are probably associated with filthiness. Hence, a proper inspection of the barns and dairies to insure proper conditions, especially cleanliness, will be a means of avoiding much of the trouble in cream ripening, and will, in many cases, result in an improvement of the butter."

THE MILK SUPPLY OF COPENHAGEN.

The city of Copenhagen depends largely for its milk upon an organization known as "The Milk Supply Company of Copenhagen;" this organization purchases its milk from the dairymen of the surrounding districts, and holds them strictly responsible for the quality of the milk and the condition of the cows which supply it; each dairyman before closing the contract, must sign an agreement, from which we extract and condense the following requirements:

(1.) The feed must be such that it does not affect the taste or character of the milk injuriously. The use of distillery slop and like substances for feed is absolutely prohibited, and the use of all feed that has been injured or is not well preserved. The use of turnips, kohlrabi, rutabagas and the leaves of all kinds of root crops is prohibited. Carrots and mangels may be used to the extent of half a bushel per day for each cow, but only when the grain feed given amounts to 7 pounds per day. Cows which supply milk for the use of children must not be fed mangels and carrots beyond the extent of one peck per day. Oil cake (rape-seed cakes) may be fed to the extent of but 1½ pounds per day, and this only in connection with at least 5 pounds of grain feed. Cows supplying milk for the use of children must not be fed oil cake of any kind. For other cows the grain mixture used shall receive the company's approval before delivery of milk can begin.

(2.) In the summer time, cows must not be fed in the barn under any conditions. They must be pastured on clover and grass. Vetches must not be used. When necessary, arrangements may be made with the company for the use of grain or green grain crops during the summer.

(3.) The cows must be clipped on the udder, tail and hindquarters in the fall before they are put in the barn.

(4.) The time of calving the cows in the herd must be distributed as evenly as possible through the year, so that the amount of milk delivered, especially during September and October, shall not be less than two-thirds of the greatest amount delivered in any month.

(5.) Fresh milk up to twelve days after calving must not be delivered, nor will the company receive milk from cows which give less than 6 pounds per day.

(6.) The utmost cleanliness must be observed in milking, and the milk must be strained through a metal strainer covered with a clean woolen cloth.

(7.) There must be at the disposal of the dairy at least 30 pounds of ice for every 100 pounds of milk produced on the farm.

(8.) Every dairy must be supplied with a Lawrence milk-cooler. This may be rented from the company if desired.

(9.) As son as it is drawn from the cow, the milk must be cooled by the use of ice water on the milk-cooler, and this at all seasons of the year. This cooling should reduce the temperature of the milk to at least 4 degrees Réaumur (41 degrees F.) before it is shipped.

(10.) The milk must be delivered at the railway station once or twice daily, as the company may desire, either as sweet milk or as half-skimmed milk and cream. It must not be sent from the dairy farm sooner than necessary to make the train and in summer the delivery wagon must be covered so as to shade the cans.

(11.) The company will supply the cans used for transportation, and they will be cleaned before they are shipped to the dairy farm.

(12.) The cans must be rinsed in cold water immediately on their arrival at the dairy. They must be kept in an airy place, protected from all dirt, with the lids removed and opening downward, but so that the air has free access to the interior, until they are used.

(13.) The can must under no circumstances be used for anything else than the transportation of milk.

(14.) The dairy farmer must agree to answer all questions concerning the milk which the company may put to him.

(15.) The dairy farmer must permit one of the company's veterinarians to examine his cattle whenever he choses, and must carry out the directions which the latter may give him. He must also agree to furnish transportation for the veterinarian to and from the railroad station.

(16.) Cows which the veterinarian finds have tuberculosis must be removed from the herd at once and disposed of as soon as possible.

(17.) Cows which are taken with any suspicious disease must be removed from the herd at once and the company informed of the fact, and if necessary, the delivery of milk may be stopped until the veterinarian has had opportunity to examine the case. But in such cases the company will pay for the milk at the same rate as though it were delivered.

(18.) If any contagious disease occurs among the persons who live on the farm, or at the homes of the laborers who work on the farm, it shall be the duty of the dairyman to inform the company of the fact at once. The milk will in such cases be paid for at the usual rate.

(19.) This contract may be terminated either by the company or the dairyman on the first of the year, but with at least six months' notice.

(20.) Should the milk found to be of so inferior a quality as to be unfit for sale, the company reserves the right to stop its delivery without remuneration.

(21.) If the sale of milk in Copenhagen should be stopped by reason of an epidemic or other nonpreventable cause, the delivery must be stopped for a shorter or longer period without remuneration.

This company employs a corps of veterinary surgeons who regularly examine all dairies which furnish milk, and any diseased animals thus found must be at once removed from the herd under heavy penalties; if the owner discovers, or thinks that he has discovered any actual disease, he at once keeps the animal's milk separate, or throws it away and notifies the company; any milk thus lost between the time the disease is discovered and the arrival of the company's veterinarian, is paid for by the company, at full market price; in some cases, the company employs the dairymaids, and even goes so far as to pay the dairy owners for their board; as soon as the milk is received in Copenhagen, each lot is carefully sampled, and at once tested for butter fat by an immense Babcock machine constructed specially for the purpose; and in addition to these and other precautions, all of the whole and skimmed milk is filtered before it leaves the depot of the company.

They supply three grades of milk, whole milk, half skim-milk, and milk for children; they also supply two grades of cream, known as first and second. For the skim-milk, the morning's milk is allowed to stand twelve hours before skimming. The children's milk is obtained only from cows which have been selected for the purpose by the veterinarians of the company, and is filtered, bottled and sealed immediately on its arrival at the depots.

In order to secure a uniform quality and to prevent the cream from rising to the top and being dipped off, or to prevent the poorer milk, after standing in the wagons, from being drawn off at the bottom of the can, a tube runs from the faucet at the bottom clear up to the top of the can; this tube is pierced with holes throughout its length, and thus effectually secures a uniform quality clear to the bottom of the can.

The filtering machines are thus described: Imagine a large bowl of enameled iron with a capacity of about 40 gallons, and this raised on supports about 5 feet from the floor. There is a hole in the bottom through which the milk enters, and near the rim are two discharge pipes, one on each side of the bowl. Now, the filtering material consists of three layers of gravel and six thicknesses of fine muslin stretched over a ring that fits closely inside the bowl, and is placed above the upper layer of gravel. The gravel is of three grades of fineness. The lower is about the size of duckshot, the middle layer finer still, and the upper layer as fine as small pinheads. Each layer rests upon a thin plate, perforated with many fine holes, and which fits closely to the sides of the bowl. Each layer is about 2 inches thick, and there is a space of an inch from the top of one layer to the tin plate which supports the next layer above. The milk is poured into a large reservoir which stands somewhat higher than the filter. A brass pipe leads from the bottom of this reservoir to the bottom of the filter bowl. The pressure thus attained forces the milk through the successive layers of gravel and six thicknesses of cloth, and when it rises to the top, it is drawn off through the delivery pipes."

SPRAYING CALENDAR.

The Hatch Experiment Station (Bulletin No. 25), has issued an extensive spraying calendar, from which we condense the following:

APPLES.

1st time. Spray with copper sulphate solution before the buds unfold, to destroy any winter spores. It is possible that the Bordeaux mixture would have results quite as good, or better if used at this time, on account of its firm adherence to the branches and bud scales.

2d time. Just before the blossoms open, spray with Bordeaux mixture, and Paris green, one pound to 100 gallons, for the apple rust, bud-moth, canker worm and tent caterpillar.

3d time. Within one week after the petals have fallen, make another application of the same, for the same insects and the apple scab, which may now appear if the weather is favorable.

The formulas alluded to in this calendar are compounded as follows:

Bordeaux mixture. Four pounds copper sulphate, or blue vitriol, four pounds fresh quick lime, and 25 to 30 gallons of water.

Ammoniacal carbonate of copper. Copper carbonate, three ounces, ammonia sufficient to dissolve the copper, and water, forty gallons.

Copper sulphate solution. One pound of copper sulphate, and twenty-five gallons of water.

Kerosene emulsion. One-half pound of common, hard soap, thoroughly incorporated or emulsified by the force pump, and add fifteen to twenty gallons of water.

4th time. In from ten days to two weeks, according to the weather, use the Bordeaux mixture alone.

5th time. Under ordinary conditions, during the month of July, only one application of the Bordeaux mixture need be made, and this should be at from two to four weeks from the last application.

6th time. After the fruit is nearly grown, only the ammoniacal carbonate of copper should be used, and unless the weather be very wet, one application will be sufficient.

PEARS.

1st time. Before the leaves unfold, use the copper sulphate solution for the leaf blight, cracking of the fruit, and the pear scab.

2d time. Apply Bordeaux mixture, and Paris green, one pound to 100 gallons, before the blossoms open, for the codling moth.

3d time. As soon as the petals have fallen, repeat with mixture as last used.

4th time. From two to four weeks after the last spraying, according to the weather; use the Bordeaux mixture alone for leaf blight, cracking of the fruit, and pear scab.

5th time. Should the weather be very warm and moist, make an application of the Bordeaux mixture from the first to the middle of August.

PEACHES

1st time. Use copper sulphate solution before the leaves appear, the same as for the apple and pear.

2d time. About one week after the petals have fallen, spray with curculio and shot-hole fungus.

3d time. For the early varieties that are subject to brown rot, apply the ammoniacal carbonate copper solution, about a week before the fruit begins to soften.

PLUMS

1st time. Treat with copper sulphate solution before the leaves Bordeaux mixture and Paris green, one pound to 200 gallons, for plum appear.

2d time. Use Bordeaux mixture and Paris green, one pound to 100 gallons of water, just before the petals open, for the curculio and black wart.

3d time Repeat the above as soon as the petals have fallen.

4th time. Repeat the same in from five to seven days if the trees have set a crop of fruit.

5th time. Spray with Bordeaux mixture alone in from ten days to two weeks.

6th time. Just before the fruit begins to ripen, spray with the ammoniacal carbonate of copper.

QUINCES.

1st time. Use the copper sulphate solution before the leaves unfold, for the leaf blight.

2d time. After two or three weeks, use the Bordeaux mixture for leaf blight.

3d time. Repeat the same application in from two to three weeks.

GRAPE.

1st time. Spray with copper sulphate solution just before the leaves unfold.

2d time. Just before the blossoms open, spray with Bordeaux mixture and Paris green, one pound to 100 gallons, making an effort to cover the clusters of buds with as much as possible, for the "rose bug" and mildew.

3d time. As soon as the petals have fallen, repeat same application.

4th time Apply same, in from five to seven days.

5th time. Use Bordeaux mixture alone, in from two to four weeks, according to the weather.

6th time. After the grapes are from one-half to two-thirds grown, use the ammoniacal carbonate of copper.

7th time. Should the season continue very warm and moist, a second application of the above may be needed, but generally one application will be sufficient.

THE POTATO.

1st time. As soon as the potato beetle has laid its eggs, spray with the Bordeaux mixture and Paris green, one pound to 100 gallons, using the barrel or knapsack pump.

2d time. In from one to two weeks, or when the larvae of the potato beetle become abundant, spray again with the same.

3d time. Repeat as above and at same interval.

SPRAYING FOR PEAR SCAB.

Experiments at the New York Experiment Station clearly prove the efficacy of the Bordeaux mixture as a preventive for pear scab, and they also prove that this fungicide may be used much weaker than had previously been supposed, and this, too, without any apparent diminution of its efficacy. These experiments also indicate that the foundations of this disease are laid at a much earlier stage of growth than has previously been supposed, and that, in fact, the disease may in reality commence before the formation of the blossoms.

One object of the leading experiment was to ascertain, if possible, the proper date at which to make the most efficacious application of the mixture. Three rows of Seckles and a number of White Doyennes pears were selected for the experiment. The first spraying was on the Seckles, and the application was made May 2d; at that time some of the more forward fruit buds were swelling, but the leaf buds made no showing. The second application was made May 10th, at which date the White Doyennes were given their first application; another application was made May 19th, when the earlier blossoms were opening; a fourth application was made May 31st, at which time the earlier blossoms were dropping rapidly; another application was made June 12th, and the final one, June 28th.

July 18th, it was found that on the unsprayed trees, there was a very large portion of imperfect fruit, and this proportion increased as the seoson advanced; it was further noted that in the tops of a few of the trees where the mixture had not reached all the fruit, the proportion of imperfect fruit was very great. At picking time the fruit from both kinds of trees was carefully picked, and sorted into three classes, the first two of which were sold, and no account was made of the imperfect fruit of the third class.

As a practical result, it was found that the sprayed Seckles gave from $5.48 to $6.67 per tree, while those not sprayed, but under the same conditions and surroundings, gave but $0.68 to $0.90 worth of perfect fruit. Of the White Deyonnes, the average value of the yield of the sprayed fruit per tree was $6.55, while that of the unsprayed was but $0.45.

Summarizing the whole experiment, it was demonstrated that the Seckles which had been sprayed six times, gave a yield having an average value per tree of $5.48; those sprayed five times gave an average value of $5.70; while the average value of the yield of those not sprayed was but $0.93. Of the White Doyennes, the average value per tree of those sprayed five times was $6.55, and of the unsprayed but $0.45.

The application of the Bordeaux mixture cost in materials, .1968 cents; in labor, .3561 cents, or a total cost of .553 cents per tree; the average cost of five applications was .476 cents per tree; applying the gain caused by the spraying to a large orchard, it would have been at the rate of from $432.10 to $562.40 per hundred trees.

In summarizing the experiment and its results, Dr. Collier uses the following language:

"In conclusion, it may be said that both the Seckle and the White Doyenne pears are varieties especially subject to attacks of scab fungus, and therefore, as previously stated, the large gains resulting from their treatment, as shown in these experiments, could not be expected to result from spraying every other variety. Yet the fact remains that the fruit and foliage suffer considerable damage each year from the fungus disease, which may be successfully treated by spraying with the Bordeaux mixture, and also from insect foes that may be treated at the same time with Paris green. It is undoubtedly true that tens of thousands of dollars might be saved annually to the New York pear growers by the universal adoption of the method of treatment which is here shown to be very successful in preventing the depredations of the worst insect and fungoid enemies of the pear."

From the experiment the following conclusions are drawn:

1. In these experiments, pear scab was successfully treated by dilute Bordeaux mixture, containing four pounds of copper sulphate to forty-five gallons of the mixture.
2. Comparing three treatments after the buds begin to open and before the blossoms open, with two treatments during the same period, it is still doubtful whether enough benefit may be gained from the former to justify the expenses of the extra treatment.
3. In order to treat pear scab successfully, the spraying must be done thoroughly and at the right season.
4. The benefits of the treatment extend to the tree as well as the fruit, as shown by the increased vigor of the foliage and fruit on the sprayed trees, compared with the unsprayed trees."

TREATMENT OF ORCHARDS.

In a recent Bulletin of Cornell Experiment Station (Bulletin No. 72, September, 1894), Prof. Bailey thus condenses the proper method of treating orchards:

"If orchards are to be made profitable, they must receive as good care as other crops.

Good drainage, natural or artificial, is essential to success. Trees are impatient of wet feet.

Well drained lands are drier in wet spells, and contain more moisture in dry spells than other lands. They can be worked earlier in the spring.

Good tillage increases the available food supply of the soil, and also conserves its moisture.

Trees should be made to send their roots deep into the soil, in order to fortify themselves against drought. This is done by draining the soil, and by plowing the orchard rather deep.

This deep plowing should begin the very year the trees are set, and it should be continued every spring until the habit of the tree is established.

Moisture is retained in the upper soil by very frequent, but shallow tillage, by means of which the surface of the land becomes a mulch for the soil beneath.

Tillage should be begun just as soon as the ground is dry enough in the spring.

This tillage should be repeated as often as once in ten days throughout the growing season, which extends from spring until July or August.

Tillage should not exist for the purpose of killing weeds. Weeds have taught the most important lesson in agriculture, to be sure, but the schoolmaster should now be able to retire.

Late cultivation may be injurious by inducing a late growth. At all events, it can be of small utility when the trees begin to mature and rains become frequent. This season of respite gives the grower the opportunity of raising a green manure, and of adding fertility to his land at trifling expense and with no harm to his trees.

Fall plowing may be advisable for farm crops, but it should generally be discouraged in orchards. The land in orchards should be left compact in the fall, and it is advisable to cover it with some close herbage.

Our cultivated crops should only be allowed in orchards early in the season. Grain and hay should never be grown.

Nursery stock should not be grown in orchards.

Even hoed or cultivated crops may rob the trees of moisture and fertility if they are allowed to stand above the tree roots.

Cultivators are the best crop to raise in an orchard.

Sod is sometimes allowable in apple and standard pear orchards, but never in other fruit plantations; but even then it should be pastured closely with sheep or hogs. If the stock is fed at the same time, the land will fare better.

Watch a sod orchard. It will begin to fail before you know it.

Probably nine-tenths of the apple orchards of New York State are in sod, and many of them are meadows. Of course they are failing.

The remedy for these apple failures is to cut down many of the orchards. For the remainder, the treatment is cultivation, fertilizing, spraying—the trinity of orthodox apple growing.

In general, level culture is the best. The modern cultivators and harrows make such cultivation easy.

Trees, especially apples, are often trained too high, because of the difficulty of working close to them. Modern tools will bring the heads within reach.

Harnesses with no projecting hames nor metal turrets should be used in bearing orchards. Those requiring no whiffletrees are also useful.

Potash is the chief fertilizer to be applied to fruit trees, particularly after they come into bearing.

Potash may be had in wood ashes and muriate of potash. It is commonly used in the latter form. An annual application of potash should be made upon bearing orchards. Of the muriate, from 500 to 700 pounds may be used to the acre in mature orchards.

Phosphoric acid is the second important fertilizer to be applied artificially to orchards. It may be got as plain high-grade superphosphate (dissolved South Carolina rock), in the bone fertilizers, and perhaps in Thomas slag. Of the plain superphosphates, from 300 to 500 pounds may be applied to the acre.

Nitrogen can be obtained cheapest by means of thorough tillage (to promote nitrification) and nitrogenous green manures. There is rarely occasion for buying it for fruit plantations, if the lands are properly tilled and cropped.

Nitrogen promotes growth. It should therefore be used with some caution, for orchard trees should be grown for fruit rather than for timber.

Barn manures are generally more economically used when applied to farm crops than when applied to orchards; yet they can be used with good results, particularly when rejuvenating old orchards.

In general, the commercial complete fertilizers are less rational for orchards than a fertilizer made for the occasion out of materials evidently needed by the trees, but the complete fertilizers give much better results than the prevailing indifference and neglect.

Cultivation may be stopped late in the season, and a crop can then be sown upon the land. This crop may serve as a cover or protection to the soil, and as a green manure.

A green manure improves the soil by adding fibre to it, and by increasing its fertility. It catches the nitrates which, earlier in the season, are used by the tree roots. Vegetable fibre in the soil increases its power of holding both moisture and plant food.

The crops well adapted to this late sowing are few. Vetch is probably the best which has been well tested in the State. But everything points to crimson clover as the ideal orchard cover and green manure.

The gist of it all is, that orchards should be cultivated and fed. Cultivation should begin early and be continued often. It may be stopped in August if the grower thinks best, and then if the land needs it, a green manure may be sown for turning under the next spring.

THE PEAR MIDGE.

(*Diplosis pyrivora*, RILEY).

In our annual report of 1892 (page 100), we called attention to the possible introduction of this comparatively new pest of the pear grower into our States. Thus far we have no reports of its introduction, but the possibilities are that it may exist for several years before sufficient numbers are propagated to attract attention.

It appears to have been introduced into the orchards of Coe Brothers, Meriden, New York, by the importation of French stocks; in 1885 they attracted the attention of the entomologist of the National Department of Agriculture, and the habits of the insect were investigated by Prof. J. B. Smith, who reported their introduction as above by the Coe Brothers, in 1877; they were first noticed in 1879, during which year they inflicted considerable damage, seemingly selecting the Lawrence trees as a favorite resort and breeding place. In 1883 they had increased to such an extent that they destroyed the whole crop of Lawrence pears, and attacked the Bartletts, but to a less degree, inflicting much less damage. By 1891, the pest had spread into New Jersey, and was that year found in Union and Essex counties. In 1892 it was found at New Brunswick, N. J., and in 1893 in Middlesex and Monmouth counties.

Schmidberger, as early as 1840, thus describes its habits:

"The number of eggs which these midges lay in a pear appears to be various, as I sometimes found only a few larvae in one pear and sometimes more than twenty. The eggs are hatched in a short time, particularly if the weather be warm, because from the fourth day of their deposition I found the small larvae on the embryo of the blossom, into which they began to bore, usually in or near the stem of the calyx. Before the blossom is expanded they descend to the core, so that they may not be exposed to the sun's rays, which, as has been already said, would endanger their existence. They separate at the core and begin to devour on all sides. When they have consumed the pulp of the small fruit, they have attained their full size, and only wait for a favorable opportunity to leave their still secure dwelling and feding house. This opportunity presented itself afeer the first rain; because the little pears, being hollowed out, begin to decay here and there and become cracked, by which means an opening is afforded to the larvae to make their way out. As soon as they get on the surface of the little pear, they bend themselves together and make a spring to the ground to bury themselves. That these larvae are not injured by such a dash on the ground, I am perfectly convinced. I let a larvae fall from a height of nine feet on the floor of a room, three times running; I then laid it on the earth in a glass, and in a few seconds it buried itself.

"If no rain happens at the time they have attained their full size, they sometimes gnaw an opening through the skin of the little pear; they usually, however, remain together in the core till the pear falls off and is bruised by its fall on the ground, when they obtain an outlet. They often remain a long time in the pear on the ground if they cannot obtain a passage out. I gathered some pears that were outwardly not injured by them, and laid some of them on a board in the room, and others on the damp earth in the glass; and I found the larvae still in the pears in the middle of July, although they were externally completely withered or decayed and covered with mold. I took them out of the pear and laid them on the earth in the glass, and most of them buried themselves in the earth."

Prof. Smith, of the New Jersey Experiment Station, has given this insect considerable attention, and (Bulletin 99), describes its pupation as follows:

"As soon as the larvae leave the infested pears, which is usually early in June, they drop to the ground and at once make their way beneath the surface, varying somewhat with the condition of the soil, from one-half to two inches, and they lie for some time unchanged. About midsummer, the larvae make oval cocoons of silk, covered with grains of sand, and lie unchanged until early in the spring. It is probable that there is some difference in the date of forming cocoons and in pupation, for Dr. Lintner records his specimens as forming cocoons as early as June 15th, while of the large number confined by me none formed such until August 3d and early in October. It is worthy of notice, too, that different seasons make quite a difference in the date at which the flies appear or the larvae mature. According to Dr. Lintner's report, larva emerged from the pears before the end of May, in New York State, and on June 10th, most of the infested pears had fallen from the trees. On June, 10, 1892, larva in Middlesex county, New Jersey, were not yet matured, and none had left the pears. None of my specimens had changed in pupa in October, when my experiments were concluded, but some time during the winter the flies matured and escaped. It is probable that in nature the pupa is not formed until early spring, and that the flies emerge soon after wards, depending upon the character of the season."

Prof. Smith's report in the New Jersey Station's bulletin indicates that the larva exist in infected pears in numbers varying from ten to thirty, and that they live on the substance of the pear and core, and thus prevent the growth of the fruit, which decays and falls off during the early summer.

The difficulty of applying remedies is thus alluded to by Prof. Smith:

"It will be at once noted from the life history that there is no period at which this insect is within the reach of ordinary insecticide applications. The eggs are laid in the bud before it opens, and the young larva get into the heart of the fruit before it is fully formed. The adult fly does not feed, and hence is beyond our reach. It is only after the injury is done that the insect goes underground and is within the reach of destructive agencies. Such destructive agencies may either be mechanical, as by cultivation, or chemical, using a substance killing by contact."

As an experiment, Prof. Smith advised Mr. White, of New Brunswick, to try the experiment of sowing kainit at the rate of one thousand pounds per acre under the trees. The application was made late in the summer of 1892. In May, 1893, it was found that not a single pear was infected where the kainit had been sown, but that in other portions of the same orchard not thus treated, there was not a Lawrence pear not infested, and fully fifty per cent. of the Bartletts were destroyed.

Early in June, Prof. Smith secured some 200 specimens of infected pears and placed them in experimental jars for treatment with different compounds, for the purpose of ascertaining what substances were best adapted for application to orchards.

After the larva had come out of the fruit, each jar was given a top dressing to as nearly as possible represent the ordinary applications to an orchard, of muriate of potash, nitrate of soda and kainit; three jars were treated with the application at the ordinary rate, and three other with a double application. As a result, it was found that the single application of muriate of potash destroyed one-half the larva; the double application killed seventy-five per cent. of them; the single application of nitrate of soda killed all but about ten per cent., while the double application left but five per cent.; the single application of kainit left but three per cent. of the larva alive, and the double application killed all.

For an orchard which has become generally infested, Prof. Smith recommends the following treatment: "Cultivate as usual, or if the orchard is in grass or clover, plow under after June 15th as soon as may be. Top dress with kainit, 1,000 pounds per acre, to benefit the trees, as well as to kill the insects. As soon as proper, say in August, sow crimson clover. This will use up the potash not required by the fruit trees and will restore nitrogen, as well as occupy the ground. Early in the following spring, turn this sod under as deeply as may be proper. It should be done before the pear buds are developed, in order to head off and destroy any midges then in the pupa state, near the surface of the soil."

SPURRY.

(*Spergula arvensis*).

The inquiries which have reached the department in relation to this plant during the past year indicate an increased interest in it as a forage and hay crop. It is comparatively a new plant in the United States, and has not yet been tested for a sufficient length of time to prove its adaptability to our climate and soil. In Europe it has, however, been long known, and in Belgium, France and Prussia it has been extensively grown for many years.

In his "Encyclopedia of plants," Louden thus describes Spurry: "*Spergula arvensis*. From *Spargere*, to scatter, because it scatters its seed abroad, to the profit of the farmer in Holland, who obtains from it meadows affording the most delicious butter. *Sarvensis* is a common weed in sandy soils; in Scotland called yarr, and in Norfolk, pickpurse. In the Netherlands and in Germany, it is sown on stubble to provide a bite for sheep during winter. It may be sown and reaped in eight weeks, either in autumn or spring. It is said to enrich the milk of cows so as to make it afford an excellent butter, and the mutton fed on it is preferable to that fed on turnips. Hens eat spurry greedily and it is supposed to make them lay a great number of eggs, whether in hay or cut green or pasture. Von Thaer observes that it is the most nourishing in proportion to its bulk of all forage and gives the best flavor to milk and butter."

In the report of the Michigan Board of Agriculture for 1887 (page 329), Prof. Miles thus refers to this plant:

"Spurry is an annual which grows wild in Great Britain, where it is usually called a weed. In Belgium, France, Jutland and Russia it is grown as a forage crop and for hay. In France its yield is estimated to be equal to a crop of clover, or 7,700 pounds per acre. The seeds are fed to cattle and horses and are thought to be about equal to rape cake in value. It is a quick and rapid growing crop, which in five or six weeks gains its full heighth of twelve to fourteen inches, and it is said to be a valuable feed for cows, improving the quantity and quality of the butter. Sown in the middle of April, with seed at the rate of fifteen to twenty-four pounds per acre, it matures the last of May, and a second crop may be grown. It has been called the clover of sandy soils."

In the report of the Michigan Board of Agriculture for 1889 (page 81), the result of their two years experience with spurry is thus summed up:

"The spurry has shown wonderful productiveness and seed production. When partially ripened, and plowed under with a very shallow furrow, it is self seeding, and produces an abundant crop. Its value as a manurial plant on these light soils is pronounced. When plowed under, it seems to enrich the soil the most rapidly of all plants used. It is valuable for a fodder plant, being eaten readily by cows and sheep. It is said to be very valuable for cows giving milk. It is a plant of first value in bringing these sands into productive fields."

In its report of 1890 the same board gives the following item of information which appears to show that some caution is necessary in sowing it, in order that it may not become a permanent weed. The report states that, "The wonderful seed production gives it a good foothold in soils when once sown. The introduction of the plant is a permanent benefit to the jack pine barrens."

In Bulletin No. 101 of the Michigan Experiment Station, the following caution is given:

"A word of caution is needed for rich soils, because the spurry forms seeds so rapidly and scatters them so freely that there is danger of its becoming a troublesome weed in rich soils. But on light sands where few plants grow with vigor, a thrifty and rapidly growing weed is a godsend."

In the report of the Michigan Experiment Station (Bulletin No. 91, February, 1893), Prof. Clute thus refers to the growth of spurry in Michigan:

"The soil for spurry requires the same preparation as for clover. The seed may be sown and harrowed in the same as clover seed. The seed is smaller than clover seed, hence there are more in number to the pound. When sown for fertilizer and forage, from six to eight quarts should be sown per acre. This thick seeding gives an even field of fine pasture and a heavy sward when cut for hay. When desired for hay it should be cut after the seed has formed, but before it is ripe. When grown for seed it branches more and gives a larger crop of better seed if only about four quarts of seed are sown per acre. When grown for seed it may be threshed the same as clover, by machine or flail. When it ripens late in the fall and is then harvested for seed, enough seed will shell out to produce a full crop next spring if the land is harrowed.

The seed germinates quickly. If the weather is warm and moist the field will begin to show green on the third day from sewing. It is ready for mowing for hay in about six weeks, and will ripen the seed in about eight weeks. It is in best condition for pasture from four to six weeks after sowing, though if necessary, animals can be turned on much sooner. It furnishes excellent pasturage for cattle, especially milch cows, though they often refuse to taste it at first, but after once eating it, will leave the richest clover pasture to return to it. Sheep seem to prefer it above all forage, and all stock thrive upon it when cut and cured, even eating every particle of the dry straw that has been threshed for seed."

Perry Ostrander, Esq., president of the Crawford County Farmers'

Association, Grayling, Michigan, thus writes to Prof. Clute in relation to his experience with spurry:

"I will give you my experience and opinion in regard to growing spurry. Opinions certainly have more weight when based upon experience. The land that I sowed to spurry last year was so-called 'pine barrens,' or plains, rather better than the average. On it I had raised crops as follows: Wheat, millet, oats, part potatoes and part peas, part corn and part millet—making in all five crops, leaving the soil in an impoverished condition. I plowed just five acres, dragged it with a flat drag, then sowed six pounds of seed per acre. I dragged once and then raked both ways with a horse rake, finishing June 15, at noon. I was surprised to find the young plants all up on the 18th of June at noon. August 18, the crop was ready to harvest. It stood about one foot high. I have made no estimate as to the amount per acre. One-half ton per acre would have been a good crop for that soil. There was certainly more than that. I did not see the field again until four weeks after cutting, when one day I was surprised at the green appearance of the stubble. Upon examination I found a volunteer crop, which continued to grow until there was about two-thirds as much as at first. Wishing to use the fall pasture in other parts of the enclosure, I turned my cows in. For about three days they would not notice the spurry. But after they 'got a taste' they would eat nothing else so long as the spurry lasted. There was a decided increase in the quantity of milk. Also the quality was improved.

"When allowed to ripen for seed I thresh it with a flail. I feed the straw to my cows together with a ration of turnips. The result is highly satisfactory, the cattle never doing better. The only trouble was in not having enough, as when the spurry was gone, they refused to eat other fodder until starved to it. The crop, as a whole, was worth more than double any previous crop. I know that it will grow where other crops fail, also that it is the best of fodder crops for cattle and sheep. As far as I know, horses do not like it.

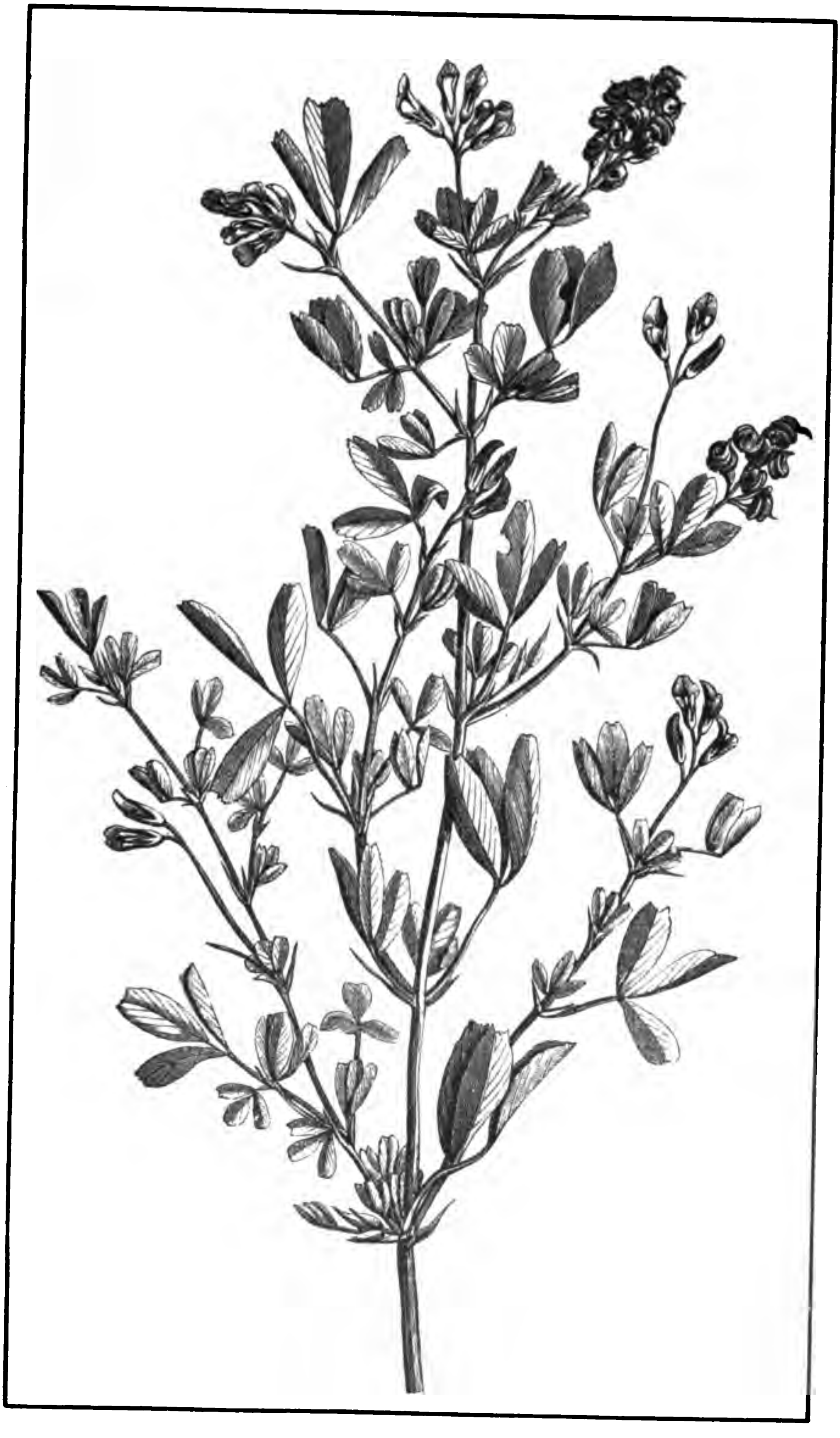
"As a manurial crop I think it will be excellent, but will test it thoroughly both by plowing under, and also by leaving on the ground as a top dressing and protection for young clover, which I shall sow and drag in after the first harvesting.

"It is my opinion, gained by experience and observation, that spurry if rightly handled will be of great value in reclaiming the pine barrens. Any plant that will grow here that will make fodder for cattle and sheep will be welcome, as sheep raising will sooner or later be the leading industry here."

ALFALFA.

(*Medicago sativa*).

The number of inquiries relating to this plant as a forage crop indicates that an interest in it has been awakened among Pennsylvania stock feeders for a further knowledge of its qualities and merits.



ALFALFA.

(*Medicago sativa.*)

Thus far, so far as reported, experiments with it in our State have not proven successful, probably because it has proven very difficult to get a good stand. In Nebraska and some of the western States the results of experiments have been different, and good stands have been secured with apparently but little difficulty. This success is probably due to the fact that to ensure reasonable success, it appears to be important that it should be sown as an independent crop, and not with wheat or other grains, as is the custom with clover in our State. Where success has been achieved in the West, it has been when the alfalfa seed has been sown on carefully prepared ground with sufficient oats or other grain to afford it shelter, but not enough to produce a crop.

It is very tender when quite young, and in cases reported in which it has been sown with wheat, it, even with an apparently good stand before wheat harvest, has been completely burned out after the wheat has been removed and the full rays of the sun allowed to strike the young plants. If instead of this the seed is sown upon nicely prepared ground and sheltered by a slight growth of oats, Western experimentors have been able to secure a satisfactory stand.

The history of this plant is somewhat doubtful, but it is believed to have been cultivated by the Greeks and Romans, and from them taken into the warmer countries of Europe. It is successfully produced in South America, and there grows where no other member of the family will live.

The Nebraska Experiment Station (Bulletin No. 35, May, 1894), gives the following description of the plant and its mode of growth:

"Alfalfa is a rather slender growing, branching plant, with leaves much smaller than those of the small June or Mammoth red clovers; it is of a peculiar dark, rich green color, and is the marked feature of any landscape where one can obtain an extended view. It flowers in a different manner from other clovers, they having the blossoms aggregated or clustered in a somewhat rounded head or bunch. This has its beautiful, small-hooded or pea-like blossoms, purple in color, scattered along its stems, loosely, in what the botanist calls a raceme. Again, as the seed pods form, they are single and coiled spirally, while in red and white clovers they are straight and crowded into a head. The seeds of all clovers are almost alike, in fact they are so nearly so that many persons cannot tell them apart without very close examination. Like other plants of this group, it has a single long and strong tap root, which throws off numerous small branches or rootlets as it passes downward. It goes to a great depth in search of moisture, and usually finds and appropriates it. Roots have been known to penetrate to the depth of over twenty feet in an open, porous soil, with no underlying substratum or hard pan. On account of the size, toughness and depth of its roots, it is not easily cut or broken, and hence the land settled to alfalfa should be selected with this end in view, of allowing the crop to remain for a series of years. When broken up, however, the soil is in most excellent condition for wheat, potatoes or almost any crop."

Nebraska farmers who have planted alfalfa recommend the use of from fifteen to thirty pounds of seed per acre, and the use of from one-fourth to one-half of a bushel of oats or rye as a shelter. All stock should be kept off the field for the first two years, and if a stand is secured, it will prove a lasting crop.

In 1892, the Nebraska Experiment Station tested numerous forage crops on plots of one-fifth of an acre each. Among others, alfalfa was sown; it was cut three times at the following dates, and with the following yields:

First cutting,	26 inches high, cut June 29.
Second cutting,	26 inches high, cut August 2.
Third cutting,	24 inches high, cut September 1.

In 1893 the same plot was again cut three times with the following result:

First cutting,	816 lbs. of hay.
Second cutting,	805 lbs. of hay.
Third cutting,	743 lbs. of hay.
Fourth growth (estimated),	180 lbs. of hay.

The plot being just one-fifth of an acre, the yield was at the rate of 12.720 pounds, or 6½ tons of hay per acre. The following table shows the comparative yields of the one-fifth acre plots under similar circumstances:

Plot No.	Variety Grown.	Hay, lbs., 1893.	Yield per acre.
1,	June clover,	473	2.865
2,	Mammoth clover,	475	2.375
3,	Als'ke clover,	413	2,065
4,	Alfalfa (first cut),	816	4.080
5,	Blue grass,	575	2.875
6,	Orchard grass,	478	2.390
7,	Timothy grass,	560	2.800
8,	Red top grass,	470	2.850
9,	Meadow Fescue,	375	1,875
10,	Tall meadow Oat grass,	600	3,000
11,	Italian Rye grass,	......	......
12,	Timothy, Blue grass, Orchard grass,	203	1,015

In the "Nebraska Farmer" of February 22, 1894, A. R. Clark, of Indianola, Neb., gives the following practical experience with this crop:

"About May 1, 1982, I sowed about two and one-half acres. I put on twenty pounds of seed on the piece and got a very fair stand. The land is bottom where timber had been cleared off; eight to ten feet to water; occasionally overflows; soil varies from light loam to dark heavy loam, almost black waxy. In 1891 the land was not tilled, but grew an immense crop of weeds, which was burnt off, plowed deep, well harrowed down and smoothed off. Seed sown even as possible by hand and harrowed in with a smoothing harrow. The weather was unfavorable after the seed sprouted, being hot and dry. Had the weather been favorable it would have been very thick. It was mown June 30, again July 30. The alfalfa came on after that and would have made a fair clip of hay, but was used as pasture. The crop of 1893 far exceeded my fondest hopes.

"I continued seeding ten acres more of the same kind of land in 1893, sowing ten to twelve pounds of seed per acre. I got a good stand, though it was by far the worst season for such work ever known here. I had the best success on corn stalk ground. Broke down the corn stalks, raked and burned them. Cultivated the land with a spring tooth harrow. I sowed the seed and harrowed down smooth. This work was done as soon as the frost was out sufficient to admit of work. But no rain came for four or five weeks, and the ground was so dry that even corn or potatoes would not sprout to do any good. For days and days the wind blew like fury, the dust and dirt went in clouds, and I thought all the seed would be blown out of the field or drifted in piles, but when a few showers came, the alfalfa came about as near in its place as one could ask for. I don't think any one need have any fears of the seed blowing away to hurt. I have a fine stand of alfalfa, though it did not make as big a growth as the year before, but I feel safe in counting on three good cuttings from it this season, getting from five to seven tons of good feed at the three cuttings per acre.

"Alfalfa succeeds fairly well on most any kind of good corn land, and with many different ways of putting it in. I saved six bushels of seed from second cutting; first cutting went for hay, and fine feed it is, too. All kinds of stock are fond of it. I never had colts do better. Fed in connection with corn fodder, hogs, chickens, horses and cattle eat it. Horses and cattle don't let a spear of it go to waste.

"I expect to put in nearly thirty acres more on that 'pink of corn land' that the editor speaks of, bottom land that is sure for corn any season. I consider twelve to fifteen pounds of seed per acre ample, if the land is well fined down with a slanting tooth harrow, then rolled with a good field roller. Sow the seed before you get the ground down too smooth, so as to get the seed fairly well covered; any way that would secure a good stand in such a drougthy spell as we had last season. It is a pretty good plan to tie to. I also secured a fair stand both on upland and bottom land where rye was sown the fall before for hog pasture, though it was so dry after the rye was sown that but little of it came up till spring. The alfalfa was sown and harrowed in; rye and all came together; hogs were kept on it until about August 1. They keep the rye and most all grass and weeds, such as hogs like to eat, down, but a thick growth of sunflowers put in their appearance, which was treated to a dose of mowing machine, and they gave no further trouble."

In answer to numerous questions which reach the Nebraska station, the following points from Hartlib's Husbandry (published in London in the year 1651),which have not materially been changed, either, by the practical experience of the station or of the Nebraska farmers, are quoted:

1. It must be sown on rich soil, not too stiff or clayey, of medium moisture.
2. The ground must be plowed three times; first time in the fall, and twice in the spring.
3. The land must not be freshly manured.
4. The seed must not be sown until all danger of frost is past.
5. Sow about as much as one-sixth of corn, (wheat).
6. Weeds must be kept down until the plants are well rooted.
7. Cut for hay when it begins to bloom.
8. In warm countries (Italy and Spain), it may be cut five or eight times in a season, but in England, probably twice.
9. It is good for all kinds of cattle, sheep and other animals, but

it, especially "agree with horses." "Lean beasts soon grow fat with it, and to milch cows it produced an abundance of milk, but must not be fed alone as it is too strong a food, filleth them too suddenly with blood as to greatly endanger their health."

1. Do not pasture until late in the season, or even not all winter. The hay will keep three years, and one acre will keep three horses.

Experiments at the New Jersey Experiment Station indicate the following points relating to the growth of alfalfa in that State:

1. It is fit for soiling purposes as early as the third week in May.
2. It may be cut three or four times each season.
3. The second and later growths if harvested as soon as the blossoms appear, make an excellent hay.
4. When well rooted, it sucessfully resists both drought and frost.
5. Under favorable conditions it does not "run out" for many years.

The New York Station gives the following points in alfalfa culture in that State; the italics are ours:

1. That lucern or alfalfa can be successfully grown in New York State.
2. That *when once established*, it thrives upon clay land but will probably do better upon good, light loam.
3. *That seed two years old loses its vitality*, and fails to germinate. Undoubtedly many failures to secure a stand of plants may be traced to poor seed.
4. That *the seed bed must be well prepared*, and, in this latitude, it seems best to plant out the seed in the spring, *and with no other crop*. The seed should be but lightly covered by rolling the ground.
5. That for seven successive years at the station, three or four cuttings per year have been taken from the plots.
6. That last year, the sixth in succession, the plots yielded more than fifteen tons per acre of green foliage, equal to 5.6 tons of alfalfa hay.
7. That alfalfa *should be cut in early bloom*, before the plants become woody.
8. That it should be cured largely in the cock to produce the best quality of hay.
9. That by chemical analysis, the hay was found to be more nutritious than good, red clover.
10. That cattle, sheep and horses all relished the hay and seemed to do well.
11. That it was found to be more digestible than clover hay.
12. That if farmers would grow this crop, *we advise them to begin with a small piece of well prepared land*, in order to see whether alfalfa does as well with them as it has at the station.
13. That probably success with alfalfa will depend largely *upon having fresh seed, a carefully prepared seed bed, and in covering the seed lightly with soil.*

The reports of the Colorado station give the following points:

1. It is easy to raise and secure a fine stand of plants *if the soil be put in proper condition.*
2. Its staying qualities are good, as the oldest fields show no diminution in growth or yield, neither does it kill by winter exposure, if given the least care and irrigation at the proper time.

3. The quantity produced by the many cuttings makes it much more valuable than the other clovers and grasses.

4. It is as digestible as clover hay, constituent by constituent.

5. Its chemical composition shows that it is a rich, strong food when properly cured.

6. Its feeding qualities are excellent, being relished by all farm animals.

Upon the other hand, the Vermont station reports the follows:

"Alfalfa was tried on over thirty farms throughout the State, and although it did well the first summer and was looking finely when the first snow came, in most cases it was winter killed, and the almost unanimous opinion of those who tried it was that it was not adapted to our climate."

A careful collation of such practical experience in alfalfa culture as we can obtain, leads to the following conclusions as being worthy of the attention of such Pennsylvania farmers as propose to test alfalfa:

1. Be sure that you obtain new seed; it is better to pay double price for the seed of the last year, as it rapidly loses its vitality after the first season.

2. Do not plant it with any crop produced for its grain; use a very small amount of oats to furnish shelter for the young plants, and after harvest, mow the oats and all weeds as high as possible, so as to still leave some shelter for the young alfalfa.

3. Do not pasture, especially during the first year of its growth; all experience proves that pasture thus gained is doubly lost by the damage to the succeeding crops of hay.

4. Sow twenty-five pounds of good seed per acre, and cover very lightly, either with a very light harrow or a steel toothed horse rake. Breeds' weeder would undoubtedly be an excellent instrument for covering the seed.

5. Cut rather younger than is customary with red clover, as it is found that any loss thus incurred on the first cutting is made up by an increase in subsequent cuttings.

6. If possible, select clean land, as one of the greatest dangers to the crop is that it may be smothered out by weeds before it is strong or large enough to take care of itself.

7. Do not go into the experiment upon too large a scale, for it has been found that the occasional severe winters of this latitude are often fatal to the young plants of the preceding summer, but that a set two years old, or older, will withstand any variation to which our climate is liable.

8. That the greatest danger to the crop is until the roots get sufficient hold on the soil, and have penetrated to a sufficient depth to collect moisture from the sub-soil.

9. That great care should be exercised in allowing stock unaccustomed to it to have access to growing alfalfa, as it is noted for its production of hoven if eaten while damp or very young.

RUSSIAN THISTLE.

(*Russian Tumble-Weed*).

This comparatively recent addition to our list of national weeds bids fair to create a great amount of trouble and inconvenience in Dakota, Nebraska and Minnesota, where it appears, without having attracted special notice, to have obtained an extensive foothold. The probable injury from its further spread is considered to be so great that both national and State legislatures have been asked to make appropriations for eradicating it, and in preventing its further spread eastwards.

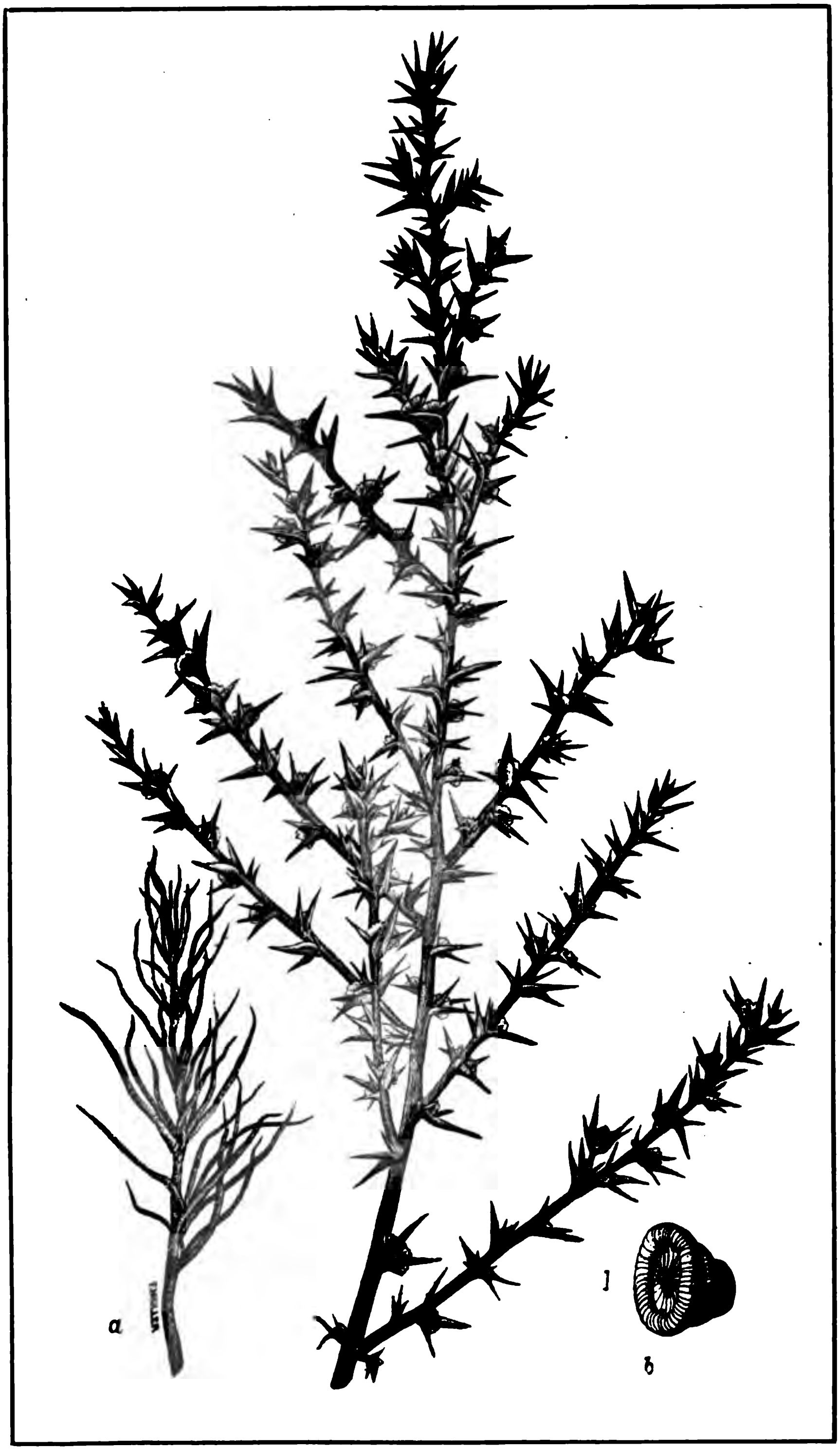
The National Department of Agriculture (Farmers' Bulletin No. 10), gives the following history of its introduction into South Dakota, where it appears to have first started in for an acclimitization in this country.

"The Russian thistle originated in eastern Europe or western Asia. It has been known in Russia many years, and has quite as bad a reputation in the wheat region as it has in the Dakotas. It was introduced into Bon Homme county, South Dakota, about fifteen years ago. Reports differ as to the methods of its introduction. There is little doubt, however, that it was first brought there in very small quantities in flax seed which was imported from Europe. There is evidently no foundation for the theory, which is too often related as a fact, that it was first sown in South Dakota by immigrants, either for forage or to inflict injury on an enemy. The few plants grown from foreign seed produced seed and increased slowly and almost unnoticed until about eight years ago, (1886). They were then thoroughly acclimated and naturalized, and seem to have partaken of the conquering spirit of the west.

"Some of its special characteristics render this thistle more troublesome than other weeds. It is armed with spines quite as sharp and much stronger than those of common thistles. Because of these it is difficult to drive horses through a field where the plants are abundant. In some sections the farmers find it necessary to bind leathers about the horses legs while at work. Horses running in pasture are often injured by having the skin on their legs badly lacerated. The spines breaking off under the skin, cause festering sores. These sores are caused by the irritation, and not by any poisonous property, as is frequently supposed. Hunters find difficulty in getting their dogs to work well for prairie chickens in the stubble, and the animals are sometimes injured by the sharp spines. Threshers find it almost impossible to get gloves thick enough to keep the spines out of their fingers and yet thin enough to work with."

Prof. Bessey, of the Nebraska Experiment Station, gives the following description of this weed:

"More or less spherical in shape and consisting of many elongated branching twigs, which grow outward and upward from the root.



RUSSIAN THISTLE.

a—Small branch of young plant, natural size ; *b*—Seed magnified five times ; large figure, a branch from a mature plant ; natural size.

When not quite mature the whole plant has a reddish color, but as its seeds ripen, it bleaches out and eventually becomes white. Well grown specimens are from two to three feet in diameter, but where crowded together they may be much less. Each twig is covered on all sides by hard, stout prickles, which are very sharp and very irritating to the touch. These prickles are in threes; that is, there are three together in a place and pointing in different directions. At the upper side of the base of each of the three prickles there is a seed, and as there are about ten of these to the inch, it is easily seen that seeds produced by every well grown plant must reach a great many thousands.

"The young plant appears in May and June; does not suggest to the farmer anything of its final form and harmfulness. It is then a soft, smooth and innocent looking plant with narrow, fleshy leaves an inch long. It blossoms in July and August, and its seeds mature in September and October. Late in the fall or early in the winter, the root breaks off and the plant is free to roll away with its freight of seeds."

Prof. Hays, of the Minnesota station, writes thus of this new pest: "It has shown its ability to travel and to thrive in a variety of conditions by migrating southwards through Iowa, Nebraska, and even into more remote States. In Nebraska it has been found in nearly thirty counties. Our railroad lines are dotted or fringed with the weed at many points, and around our stock yards and many of our large terminal elevator centres it has gotten a firm and dangerous hold. It is now so situated that it can very rapidly distribute from these many centres, and from many others sure to become infested by the further importation into our State, and if left uncontrolled, it will soon become a common and pernicious weed. The great body of this weed invasion will come upon us through our western border before winds which drive unhindered across our nearly treeless and fenceless Western prairies. Likewise, from the centres infested within the State, will the winds roll these weeds into our fields, scatter seeds along our wagon roads, and into every nook and corner where a weed can thrive, will this pest find a place to centre as a nuisance."

Among the many plans suggested to eradicate this weed, Prof. Hays suggests the following:

"A year's experience will tell us how to meet the difficulties. No one has heretofore been able to fight this weed alone. It is an annual, however, and grows from the seed each year, and the plants are easily killed by means of the hoe, cultivator or any tool, or implement which will uproot or seriously disturb them. They are easily pulled up, and when turned with the plow, they die. The individuals are easily killed and if all plants, large enough to travel before the wind, are kept from ripening their seed, the weed will not be very hard to eradicate from each farm. By preventing plants from seeding for two years, the pest would disappear. That might not be possible, but it looks reasonable that the plants could so nearly all be kept down for two years that occasional sources of remaining danger points could be found and looked after, and in a few years the land would be freed entirely from the pest. The essential need is, not to allow any plants to mature seeds, especially plants large enough to travel or roll. The seeds already ripened in the land should be encouraged to germinate that they may be killed by the plow, hoe, frost and other agencies. There is no easy "cure-all," no specific except eternal vigilance; brains for a plan, and willing hands on the spot to do the work at the right time."

POTATO SCAB.

The gradual and study increase of this pest to the potato grower, bids fair to become one of the most serious problems which have yet met our Experiment Stations; the recent investigations into the nature of the cause of the disease have, it is true, given us an insight into the proper mode of preventing it, but it still remains apparent, that if the soil is badly infested with it, no remedy is of any practical use. It may be destroyed on the seed tubers and in the baskets, planters, buckets, etc., but if fairly introduced into the soil, there appears to be no plan known by which it can be removed, and for all practical purposes, that soil must be abandoned for the potato crop. At our several institutes during the past winter, Mr. Terry, of Hudson, Ohio, stated that he has introduced the germs of this disease upon about five acres of his land by feeding the scabby potatoes to the family cow, and using the manure for other crops. The germs of the disease were not injured by the digestive organs of the animal, and the warm manure proves one of the best hot beds in which to propagate the already numerous germs, and if once introduced into the soil in this or any other way, Mr. Terry stated that there was no known way to destroy them; he further stated that he would willingly give $100.00 per acre to get his land free from the disease.

In the Connecticut Agricultural Experiment Station report for 1891 (page 158), Prof. Thaxter states, "That the practice of feeding scabby tubers to stock is one of the most important means by which the disease is spread on farms. In view of the well known fact that great numbers of the fungus spores can and do pass through the digestive tract without injury, and that the scab fungus is known to grow luxuriantly in decoctions of horse or cow dung, it is not unreasonable to assume that its spores in passing through the digestive tracts of stock fed with diseased potatoes, continue their development in the manure after evacuation."

The formation of the "scab" by this fungus growth is thus described by Prof. Bolley, of the North Dakota Experiment Station (Bulletin 4 December, 1891): "In order to understand the form in which the scabs as such assume, one must keep in mind the structure of the potato tuber and the effort always made by living tissues to heal a wound. In plants, this is most rapidly accomplished by the formation of bark, rind, or corky tissues composed of layers of tubular cells, rapidly developed from the underlaying, soft tissues. The ultimate form which the scabs assume is the result of a continuous formation of layers of cork below the area of the disease, because of the irritating and eroding action of the parasite. These latter cork formations push up, distort and rupture the disease eaten parts above."

At the New York Experiment Station, at Geneva, tests were made with numerous compounds, in which the seed potatoes were soaked one and one-half hours; the compounds used were mixed as follows:

1. Copper Sulphate (Blue Vitriol or Blue Stone) one ounce dissolved in one gallon of water.
2. Iron Sulphate (Copperas) one ounce dissolved in one gallon of water.
3. Zinc Sulphate (White Vitriol) one ounce to one gallon of water.
4. Eau Celeste.—Dissolve one pound of Copper Sulphate in water, and just before using add one and a-half pints of Ammonia and dilute to twenty-two gallons.
5. Bordeaux mixture.—Dissolve six pounds of Copper Sulphate, add a whitewash made from four pounds of fresh-slaked lime and dilute to twenty-two gallons.
6. Mercuric Chloride (Corrosive Sublimate).—Dissolve two ounces in two gallons of hot water, and let it stand several hours or over night, then dilute to fifteen gallons.
7. Ammoniacal Solution of Copper Carbonate.—Wet five ounces of the Carbonate with a little water, then dissolve in three pints of Ammonia 26 degrees and dilute to fifty gallons.

In planting the experimental plots, the seed used was divided into different portions, and each one soaked for one and one-half hours in each one of the solutions given; as a result, it was found that the Eau Celeste mixture prevented the germination of the cuttings; that the Mercuric Chloride (Corrosive sublimate), mixture decreased the percentage of scabby potatoes from 34.9 to 15.1; that the Iron sulphate decreased the percentage of scabby potatoes from 49.5 per cent. to 26.9; that the Zinc sulphate decreased the ratio of scabby product from 49.5 per cent. to 34.6; and that the Bordeaux mixture decreased the ration from 34.9 to 22.9 per cent.

Due allwance must be made for the fact that in the above experiment, the soil in all of the plots was more or less infected with the scab, and that the effect of the solution was merely to kill the scab germs which existed upon the seed before planting, and that they had no effect, whatever, upon the germs existing in the soil. Mr. Terry, after repeated trials, is positive that if the soil is free from the germs of the disease, it is safe to use scabby potatoes for seed, provided they are soaked one and one-half hours in the corrosive sublimate solution, made as directed by the New York Station.

Those who are interested in the results of Prof. Thaxter's experiments and deductions, will find them in the annual Report of the Board for 1891 (page 37).

Experiments, at first accidental, and afterwards conducted with a special view as to the results, appear to show that fresh or quick lime applied to the soil has the effect of greatly increasing the percentage of scabby potatoes. At the Rhode Island Station, a strip across a plot intended for potatoes was treated with lime at the rate of 5400 pounds per acre, the application having been made without reference to any possible effect upon the potato crop; the rows were so planted that they all crossed the limed strip nearly at right angles, and the increase in the proportion of scabby potatoes on the limed strip was so evident that it was readily noticed before the crop was measured and sorted. It was found that plots Nos. 25 and 29, to which the lime had been applied, gave respectively, 48.5 and 47.7 per cent. of scabby potatoes, while the unlimed plots, Nos. 23 and 27, otherwise treated just like Nos. 25 and 29, gave but 3.3 and 5.7 per cent. of scabby tubers, respectively.

Somewhat similar experiments appear to show that unleached wood ashes will, in some unexplained manner, increase the percentage of diseased tubers very materially, and it has been claimed that any alkaline fertilizer will have a similar effect, but to a less degree.

THE GROWTH OF CORN.

The Wisconsin Experiment Station has been conducting a series of experiments having for their primary object, a computation of the amount of water necessary to form one pound of dry matter in corn, and also to show the extent and manner in which the roots permeate through the soil.

Among other points brought out by this experiment, we have the following:

That, from some causes not explained, flint corn requires less water to form one pound of dry matter than dent does, and that, therefore, it was necessary in the experiment to consider the two varieties separately.

That the average amount of water (the average for four careful experiments), required to produce one pound of water free matter in dent corn, was 309.84 pounds; or at the rate of 2,916.95 pounds per acre for the production of 9.76 tons of dry matter.

That, taking the average of two experiments, it requires 233 pounds of water to make one pound of dry material in flint corn; and that the water consumed, was at the rate of 3.201 tons per acre for the production of 12.05 tons of dry matter.

In the Wisconsin experiments, all the water which the crop could consume was supplied, and of course, in excess of the natural supply. In relation to this phase of the work, Prof. King wrote as follows:

"It does not, of course, follow, from these experiments, that well tilled fields, if irrigated properly, will produce such yields as those recorded here; neither does it follow, necessarily, that these large yields owe their excess over normal crops, simply to the extra supply of water added at the proper times. I believe, however, it does follow from these experiments that, were our water supply under better control and larger at certain times, our yields would be much increased if not actually doubled. It does follow, also, that well drained lands in our State are not supplied naturally with as much water as most crops on them are capable of utilizing, and hence, that all methods of tillage which are wasteful of soil moisture, detract so much from the yields per acre. What we call good average yields per acre are determined in a large measure by the amount of water which is available to the crop during its growing season, and what we call good yields would be much larger under a larger supply of moisture applied at just the right times."

The report (Annual Report of Wisconsin Experiment Station for 1893), contains photographs showing the extent, depth and position of the roots of corn at various stages of its growth, and to those who have not given the matter much examination, the extent of the roots at the time of the last cultivation of the crop (the protograph showing the roots at the last working), will be a surprise. The roots are shown to a depth of about two and one-half feet, and completely interlock each other from row to row.

In referring to the ability of these roots to collect and make use of the water in the soil, Prof. King writes thus: "Roots are the water gatherers of plants, and when it is understood that the roots of each average stalk of corn must withdraw from the soil, out of which no amount of pressure can squeeze a drop of water, about 120 pounds, or five full pails, it is not to be wondered at that this great American food plant sends its roots foraging far and wide through the soil in the manner shown by the photographic engravings. And then, when it is realized that each full hill of four stalks must needs get 20 pailfuls of water out of the soil within reach of its roots, it is plain that only the great mass that is shown in the engravings, penetrating to a depth of four feet in the soil, is capable of doing such work; and the task seems more wonderful when we remember that the major part of it is done late in the season when the soil has become comparatively dry."

The following table shows the data collected during the experiments alluded to:

Table showing the amount of water required for a pound of dry matter of corn in Wisconsin.

Dent Corn.	Pounds of water used.	Pounds of dry matter produced.	Pounds of water per pound of dry matter.	Computed yield per acre.	Compound Amount of Water Used.	
					In tons per acre.	In inches.
				Lbs.		
1891. 1,	300.45	1.0152	295.95	......	......	......
2,	298.65	.9727	307.03	19,845	2,991.53	26.39
1892, 1,	235.96	.9905	238.22	......	......	......
2,	225 24	.5657	398.15	19,184	2,842.37	25.09
Averages,	......	......	309.81	19,515	2,916.95	25.74
Flint Corn.						
893. 1. Not manured,	316.44	1.364	233.0	33,620	3,900	34.42
2. Manured,	314 64	1.409	223.8	34,730	3,878	34.23
1893. 1. Not manured,	172.94	.3855	223.0	9,505	2,131	13.06
2. Manured,	234.89	.9125	257.4	22,540	2,895	25.56
Averages,	......	......	233.9	25,099	3,201	26.82

PLANTS AND NITROGEN.

Science has plainly shown that so far as their relation to nitrogen is concerned, our common farm crops may be divided into two classes, one of which can, by a process not yet thoroughly understood, obtain nitrogen from the air, while the other class is entirely destitute of the ability. It has also been shown that a large crop of red clover may be removed from the soil and still leave it richer in nitrogen than before it was grown.

These and other points which might be urged, serve to show the importance of the systematic use in the rotation of such crops as have this power, and the throwing out, at least as far as is consistent with economical farming, such as have not the power, and it follows that the production of red clover, or in fact any of the legumen family, will, whether fed on the farm or plowed under, serve to greatly increase the supply of the important element of nitrogen, which in the fertilizer market, will cost the farmer not less than eighteen cents per pound.

For a number of years our scientific experimentors have endeavored to ascertain just wherein this peculiar quality of the legumens lay, and just how they obtain the nitrogen from the air, which, as a source of nitrogen, appears to be practically inexhaustible, four-fifths of it being represented by this element.

Prof. Allen, of the United States Department of Agriculture (Bulletin No. 16), offers the following theory of this peculiar action:

"The manner in which this nitrogen assimilation takes place has been carefully and patiently studied by scientists, and although the details are not fully understood, the primary cause has been found. It is believed that plants are enabled to get this nitrogen through the activity of the lower forms of life, bacteria or microbes, which can only be seen with the aid of a powerful microscope. These organisms live in the soil and are to be found where leguminous plants have been grown. They produce or cause the plant to produce little nodules, or tubercules, on the roots. It is through these tubercules that the plant gets its atmospheric nitrogen. The air enters the soil by the numerous pores or openings in it, which are produced by plowing, cultivating, and working the soil, by the decay of rootlets, by earthworms, etc. By just what physiological process the nitrogen assimilation takes place is a question still in dispute among scientists. It is sufficient for practical purposes to know that nitrogen is taken up from the air by the growing plant, directly or indirectly; and that this nitrogen assimilation takes place as a result of the life of bacteria. It is a peculiar fact that few, if any, root tubercles are formed when leguminous plants are manured with nitrogen; the plants must first hunger for nitrogen before the tubercles are formed, and the presence of tubercles indicates that the plant is taking nitrogen from the air.

Now, curious as it may seem, there appear to be different forms of bacteria for different kinds of plants. Hence, it sometimes becomes necessary to provide crops with the necessary bacteria before they can use the nitrogen of the air. This is done by applying a light dressing of soil in which the kind of plants it is wished to grow have been previously grown. This is called soil inoculation. It is sometimes necessary in growing a crop on a piece of land for the first time in several years. Suppose, for instance, that peas which had been sown on land manured with phosphate and potash but without nitrogen failed to grow luxuriantly. If the other conditions were favorable, the inference would be that bacteria of the right kind were lacking in the soil, and a light dressing of soil in which peas had previously been successfully grown might be applied. Such treatment as this has been repeatedly tried with success on a large scale."

ANIMAL MECHANICS.

Dr. Miles recently delivered an address before the Michigan Stock Breeders' Asociation, from which the folliwing abstract is condensed:

In the lecture referred to, animals were compared to machines for converting vegetable products of the farm into animal products of greater value. This simile, which is often made, is of greater significance that at first sight would appear, and, if breeders will keep in mind the fact that they are, in effect, providing machines for doing work of the manufacture of meat, milk, wool, muscular power, or other animal products, from the raw materials derived from the soil, the means of improvement will be more readily understood.

This simile of the machine makes apparent the fallacy of the old notion that the animal that eats the least, is the best for the farmer. It would certainly be a poor recommendation for a machine to say that it could work up but a small amount of raw materials. The object of the farmer is profit, and in every department of production, the aim should be to obtain the largest net return from the raw material he has to dispose of. The more the animal machine can do of useful work, the greater value to the farmer, if the results are obtained with the greatest economy.

The Doctor claims that all forms of energy may be transformed into heat, and that, therefore, heat is the unit for measuring all energy; it is also claimed that the unit of heat is that amount which will raise the temperature of one pound of water one degree. The mechanical equivalent of this is 772 foot-pounds. That is to say, in other words, that the amount of heat which will raise the temperature of one pound of water one degree, will also raise 772 pounds one foot, or one pound seven hundred and seventy-two feet, the weight in pounds being multiplied by the number of feet it is raised; to change this into foot-tons, it is only necessary to divide it by 2000.

Or, in the words of the reporter, "When a weight of one pound is raised 772 feet, it represents in that position, 772 foot-pounds of potential or stored energy, and when this weight is allowed to fall the entire distance without interruption, the stored energy is transformed into active energy or motion, and when this motion is arrested on completion of the fall of 772 feet, heat is liberated sufficiently to raise one pound of water one degree in temperature, or, the equivalent of energy required to raise the weight to the heighth from which it fell. This serves to illustrate what is meant by the conservation of energy.

The transformation of food constituents into animal substance involves the performance of work by the animal machinery of nutrition, which is carried on at the expense of the stored energy of the food consumed. An expenditure of energy in work is as necessary to convert corn or grass into animal substances, as it is in hauling a load on the road, and the term, work, is as applicable, in the same sense, in the one case as in the other. Sheep growing wool, cows giving milk, and animals fed for the butcher, should therefore be recognized as working animals as well as those in draft or in lighter and more rapid work of the road."

Having laid down these general principles, Dr. Miles proceeds to show from the experiments at Rothamstead, that all food fed to an animal was merely stored up force, a portion of which went to support the animal economy, and another portion was used up in storing up energy in the animal in the form of reserve force, to be used in the future, either in replacing food not furnished, or in carrying the soil productions to a still higher form in the human race.

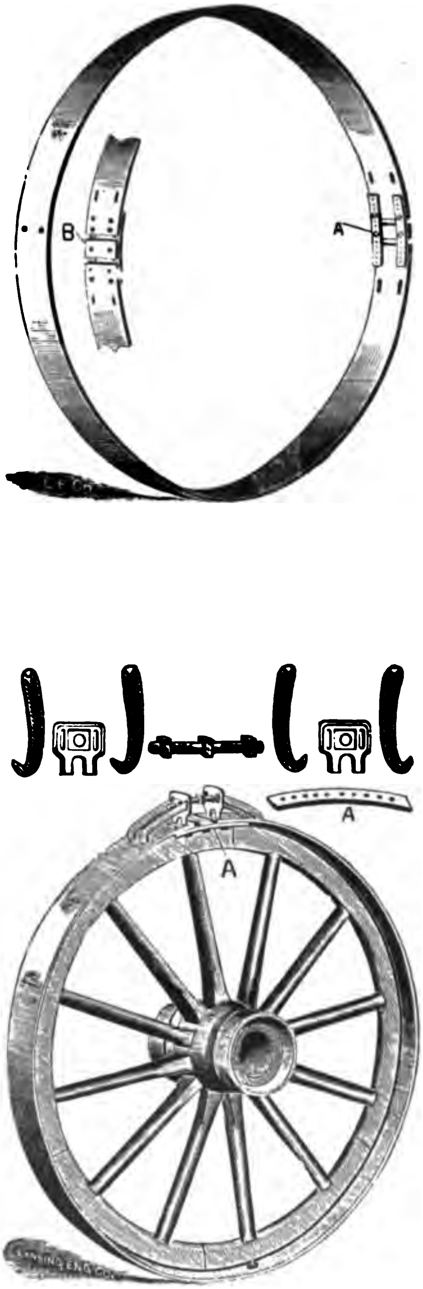
In his consideration of the questions of rations and their results, Dr. Miles thus speaks: "From the prominence given to the chemical theory of nutritive ratios in some of our agricultural papers, farmers are asked to believe that success in feeding depends upon following certain theoretical formulas, giving the proportions of food constituents in the rations fed, while the animal machine which does the work of manufacturing valuable animal products, and the motive power that makes it efficient, are entirely ignored. I can only say in passing, that in the present state of knowledge, we cannot formulate the constituents of foods in chemical terms to serve as practical guides in feeding. The machine itself is the more important consideration, and its capacity for doing the work required of it, is of far greater significance that the proportions of the comparatively small amount of the so-called nutritive constituents stored up or used by the animal."

By a skilfully constructed table, Dr. Miles showed the various elements in a crop of corn, consisting of 3,360 pounds of grain, and 3,840 pounds of fodder, and also in a fat steer having a live weight of 1,419 pounds. The former he demonstrated represented a stored up energy which was equivalent to 17.083.000 foot-tons, and the latter energy which was equivalent to 3.381.000 foot-tons; the former he claimed was equivalent to the work of the average horse, night and day, for 719 days, and the latter, to the work of the same horse for 142 days continuously.

In summing up the stored up energy in the crop of corn, Dr. Miles used the following language:

"This stored energy of the corn does not, however, represent the total expenditure in the growth of the crop. Experiments show that for every pound of dry organic substance formed by the growing corn, about 300 pounds of water will be exhaled or thrown off by the plants in the form of vapor. To convert into vapor involves an expenditure of energy, and this for the acre of corn, would be approximately equivalent to the work of 24 horses for six months without intermission . Water is likewise evaporated from the soil as one of the essential conditions of fertility, and this calls for further expenditure of energy, which, under our climatic conditions, may be estimated at about twice the amount expended in exhalation from the plants themselves. Taking all of these processes together, the energy expended, directly and indirectly, in nature's invisible, unobtrusive work of growing an acre of corn, must be equivalent to the work of 76 horses, day and night, for six months."

Referring to the present status of breeding and the improvement of live stock, Dr. Miles uses the following language: "The most serious obstacles to the progress of agriculture at the present time arises from the one-sided and misleading statements that are made in the



ADJUSTABLE WIDE TIRE.

name of science by those who have but a superficial knowledge of nature's laws and their intimate relations to farm products. The experiment station reports, on the feeding of animals, fail to give a full statement of all of the factors that may influence the results, and too often the record is made to conform to hasty assumption or false theories, so that it is difficult to find a grain of truth in the mass of chaff that is scattered broadcast over the country."

THE EFFECT OF WIDE WAGON TIRES.

At several farmers' institutes during the past winter, the effect of wide and narrow tires for wagons was under discussion, and considerable difference of opinion, even among practical men, was developed, but it was evident to the careful observer that this difference was mainly due to the fact that while one party looked at the effect from the standpoint of farm work only, the other viewed it from the point of road work alone. It is evident that rules and laws which regulate the draft of wagons upon the soft and yielding fields and sods of the farm, will not apply, and in fact, may be directly reversed, when applied to hard and unyielding public roads.

At a trial made by the Studebaker Wagon Company, at South Bend, Indiana, great care was taken to eliminate any outside causes which might affect wagon drafts; the dynomometer used was carefully tested to ascertain its correctness; wagons of the same make, but with different widths of tire, were used, and the wide tire was replaced by narrow on the same wagon; the following table gives, in a condensed form, some of the results attained:

Width of tire, 4 inches.

Weight of wagon and load,	4,345	pounds.
Draft to start load on block pavement,	350	pounds.
Draft to move load at a dead pull on block pavement,	100	pounds.
Draft to start load on good, hard, sandy road,	700	pounds.
Draft to move on good, hard, sandy road,	275	pounds.
Draft to start load on good, level gravel road,	600	pounds.
Draft to move load at a dead pull, on good, level gravel road,	175	pounds.
Draft to start load in soft mud,	800	pounds
Draft to move load at dead-pull in soft mud,	550	pounds.
Draft to start load in deep mud, (12 to 14 inches),	1,050	pounds.
Draft to move load at dead-pull in deep mud,	550	pounds.

Removing the 4 inch tire and substituting those but 1½ inches wide, we have the following results:

Width of tire 1½ inches.

Weight of wagon and load,	4,235	pounds.
Draft to start load on block pavement,	300	pounds.
Draft to move it at dead-pull on block pavement,	75	pounds.

Draft to start load on good, hard, sandy roads,	725 pounds.
Draft to move it at a dead-pull on hard, sandy roads,	300 pounds.
Draft to start load on good, level gravel roads,	650 pounds.
Draft to move it at a dead-pull on hard gravel road,	175 pounds.
Draft to start load on muddy roads,	900 pounds.
Draft to move load at dead-pull on muddy roads,	500 pounds.

A comparison of the results of these two experiments furnishes us with the following summary:

1. You can start 597 pounds more on 1½ inch tire with the same amount of power exerted, than you can on 4 inch tire, on block pavement.

2. You can haul 1,301 pounds more on block pavement, with 1½ inch tire, with the same amount of power exerted, than you can with 4 inch tire.

3. You can start 260 pounds more on good, hard sandy roads with 4 inch tire, with the same amount of power, than you can with 1½ inch tire.

4. You can haul 505 pounds more on good, hard, sandy roads with 4 inch tire, with the same power, than you can with 1½ inch tire.

5. You can start 471 pounds more on level gravel roads with 4 inch tire, with the same power, than you can on 1½ inch tire.

6. You can haul 110 pounds more load on level gravel roads, with 4 inch tire, with the same power, than you can with 1½ inch tire.

7. You can start 652 pounds more on muddy roads with 4 inch tire with the same power, than you can with 1½ inch tire.

8. You can haul 313 pounds more on muddy roads, with 1½ inch tire, with the same power, than you can on 1½ inch tire.

9. The only advantage with the narrow tire is in starting and hauling on block pavement, and on muddy roads.

Another series of experiments were instituted for the purpose of ascertaining the difference in draft between wide and narrow tire upon grass sod, with the following results, the sod being the same in both cases.

Weight of wagon and load,	4,590 pounds.
Draft to start load with 1½ inch tire, cutting into sod 1½ inches deep,	1,250 pounds.
Draft to move load at dead-pull,	650 pounds.
Draft to start same load on good, hard roads,	850 pounds.
Draft to draw load on good, hard roads,	350 pounds.
Draft with tire 3 inches wide, on same sod,	1,100 pounds.
Draft to move load at dead-pull, (same sod),	550 pounds.
Draft to start load (with 3 inch tire) on hard roads,	700 pounds.
Draft to move at a dead-pull, on hard roads,	350 pounds.
Draft at a dead-pull on hard pavement,	125 pounds.

The conclusion drawn from the results of this experiment may be thus summarized:

1. You can start 530 pounds more with a 3 inch tire, with the same power, than you can with a 1½ inch tire, when hauling over sod or sod fields.

2. You can haul 805 pounds more with a 3 inch tire across a sod or soft field than you can with a 1½ inch tire.

3. On hard roads you can start 935 pounds more with 3 inch tire with the same power, than you can with 1½ inch tire.

Similar experiments furnish data from which we draw the following deductions:

1. You can haul 200 pounds more with 4 inch tire on hard block pavement, with the same power, than you can on 1½ inch tire.

2. You can haul 605 pounds more on good, level, sandy roads, with the same power, on 4 inch tire than you can on 1½ inch tire.

3. On sandy roads, where the tire cut in 3 inches with wide tire, the draft was the same, viz, 650 pounds.

A summary of the whole series of experiments gives us the following conclusions:

1. That on hard roads, block pavements and other permanent and substantial roads, there is not argument, so far as actual draft is concerned, in favor of the wide tires, the effect being rather against the wide tire.

2. That in their effect upon hard roads, the wide tire have the advantage, and that this benefit is not sufficiently appreciated by turnpike and macadam road companies.

3. That in soft mud, slush, and under similar circumstances, under which even the wide tire cuts in, the advantage is against the wide tire and in favor of the narrow.

4. That on sod and soft ground, where the wide tire does not cut in and the narrow does, the advantage is on the side of the wider tire.

5. That in loading a team, a draft of 650 pounds steadily applied, is as much as should be expected for a days' work, and that on soft sod, this may mean, when a dead-pull has to be taken, an increase in the draught to 1,200 pounds.

6. That the difference, in the latter case, between the regular draft of 650 pounds and the increase of 1,200 pounds, is equivalent to an addition of two tons, five hundred and eighty pounds to the load.

7. Or, that in other words, the draft of the load being 650 pounds, it may be considered as equivalent to a load of two tons, five hundred and eighty pounds, and the difference from the steady draft of the load in fair motion and that of the same load started at a dead-pull, is equivalent to doubling the load.

The committee who had charge of the test closes their report as follows:

"We advocate wide tire for farms, and narrow tire for good roads and pavements."

Experiments at the Utah Experiment Station demonstrated that a given load on 1½ inch tire drew 41.6 per cent. heavier than when on three inch tire, the draft being on a fairly stiff grass sod; on a moist, but hard road, the 1½ inch tire drew 12.7 per cent. heavier than the 3 inch.

An excellent authority upon the subject of the effect of wide tire, gives the following evidence in their favor:

"In New York state, the experiment was made of using wide tires on a road about five miles long, leading to a stone quarry. The heavy wagons used thereon were equipped with rear wheels having tires six inches wide, and forward wheels having tires four inches wide, the forward wheels tracking just inside the rear wheels. Each wagon was thus transformed into a roller covering twenty inches in width every time it passed along. Smaller wagons were equipped with wheels similar in principle. The road, which formerly rutted incessantly and deeply, was covered with stone chips, which these wagons soon rolled into a hard mass. The road now supports loads of from 8,000 to 10,000 pounds, and consequently has a hard, compact and regular surface; the cost of hauling loads over this road is reduced about twenty per cent."

SALE OF DISEASED MEAT.

In the work of suppressing contagious diseases of live stock, the State officers very often sacrifice animals the flesh of which would be perfectly safe as food; they have always accepted the theory that they cannot afford to take any risk when the health of the public is concerned. During the work incident to the suppression of the so-called contagious pleuro-pneumonia, thousands of pounds of flesh were buried, which, in the opinion of the best authorities and of the State officers themselves, would have been better for use than much of that which eventually reaches the consumer in all of our large cities; but the carrying out of the principle laid down at the commencement of the work, that no risks must be taken, compelled them to bury the carcasses and cover them with quick lime; and yet they were all aware that in some of the European states, a special market is opened for meat from animals condemned with contagious pleuro-pneumonia, after inspection by proper officers, and that the loss to the government and to the individual is thus very much lessened.

Quite recently it became necessary to slaughter one hundred and thirty animals to prevent the further spread of a well-known contagious disease; the animals were in excellent condition, and ninety per cent. of them would have been sold in the open markets of any of our large cities without any question, but it was properly decided to bury and cover them with quick lime.

The principles involved in the sale of the meat of a diseased animal received a judicial interpretation in a recent case in which a drover sold a butcher an animal suffering from a disease known as "lump jaw;" in the suit it was contended that the disease was a local one, and was confined to the jaw, which in the case under which suit was brought, was not made use of as food. The case came up under the Act of March 31st, 1860. In the decision, the judge ruled as follows:

"The question raised in this case is whether the petitioner, who is indicted for the violation of the Act of March 31, 1866, Section 69, Pamphlet Laws 401, is entitled to his discharge under the writ of habeas corpus, because the sale was of a living animal. The petitioner is a drover who sold to one Paul, another drover and also butcher, a live steer admittedly and visibly suffering from a swelling on the jaw, which proved, in fact, to be the disease known as actinomycosis or lump-jaw."

"The statute of 1860 declares that, if any person shall sell or expose for sale any flesh of any diseased animal or any other unwholesome flesh, knowing the same to be diseased or unwholesome, he shall be deemed guilty of a misdemeanor. The decision of the present case depends upon the rigidity of interpretation to which this law is subjected, and how far the rule that penal statutes are to be strictly construed, concerns us. No one should wish for the day when any policy other than this is to prevail, and it is well that in controversies between the individual and the community that the man comes first and the State second."

"The district attorney has urged with great force that the machinery of law provides no satisfactory safeguards other than an examination of the living animal, and it is true that our method of inspection is but a makeshift, which, effectual as it has been, owes all its virtue to the courage and intelligence of the Director of Public Safety. It would be foolish not to acknowledge that with inadequate legal protection against the sale of deadly meat, the unrestricted right to sell diseased living cattle would cause Pennsylvania, which is surrounded by other states which care for their citizens, and Philadelphia in particular, where the condemnation of cattle by the United States officers as unfit for export abroad is constantly going on, to become the dumping ground of all the cancerous and tuberculous stuff in the land. When animals, worthless everywhere else beyond the value of their horns, hoofs and skin, can be sold for meat in Pennsylvania, it is easy to see what will happen here should the petitioner's contention prevail."

"The Act of 1860 makes a distinction between the flesh of a diseased animal and unwholesome flesh. The latter may in no way be diseased, though it may be too old to be fit for food, or,as in the case of the so-called 'monkey-veal,' be too young, or it may be putrid, and it is only by a quibble that the seller of diseased flesh escapes, if he is acquitted, because at the time of the sale the animal was yet alive. It is easy to legitimate sales for other purposes than for food without abating a jot from the laws which protect health. The owner of an apparently diseased animal can, too, and should, ascertain its condition, whether of local or general sickness, and whether proper for slaughtering or not; the pulse can be measured, the breathing observed, tuberculin can be administered in cases of suspected tuberculosis, remedies can be applied, and more delay in awaiting the natural progress of the malady may settle most of the doubts. The public on the other hand, has few and imperfect means of learning the truth. The butcher, in many cases, has no resource but a microscopic examination, and may have seen nothing to give him cause for suspicion. The consumer is still more helpless and is the final sufferer. It is no answer to say that a steer may have the lump-jaw and yet a particular cut of its beef be wholesome, or to contend with an eminent physiologist, that cooking makes all safe. In the first place, it is a mere accident that the special piece of meat is sound, and, secondly, there is no standard of temperature in the practical process of cooking. It is then, nothing less than an outrage to subject the citizen to the risk of eating cancerous flesh, when his chance of escape lies only in the fact that his flesh may have come from a part of the animal which the corruption had not reached, or that fire had been so thoroughly applied that the meat, though rotten, had ceased to be poisonous.

Following the rulings of Judge Thayer, in Commonwealth vs. Fox, Q. S., December Term, 1891, No. 426, and Commonwealth vs. Lewis, Q. S., December Term, 1891, No. 422, which in principle govern the present case, the writ is dismissed and the petitioner remanded."

DISEASES OF ANIMALS.

As veterinary science progresses, it becomes more and more evident that surroundings have much more to do with the disease of our animals than we had formerly supposed, and that in many cases, heavy losses of live stock might have been entirely prevented by more careful attention to scientific rules and to sanitary surroundings. It is perfectly safe to estimate that, from the experience of the officers of the Board in dealing with disease of live stock during the past year, that with proper suroundings and proper precautions, many thousand dollars worth of live stock might have been saved.

While it is true that no amount of neglect of sanitary laws will create tuberculosis, and that it cannot be created without the presence of its specific germ, yet it is true beyond contradiction, that the character of the outbreak af tuberculosis is largely dependent upon and governed by the surroundings as they relate to ventilation, shelter, etc. In fact, the experience of the past year has clearly proven that in the direction of shelter and high feeding, we have gone beyond the safety points and beyond the line of greatest profit; it is true that by shelter, warmth and high feeding we can and do increase the yield of milk and butter, but it is equally true that this profit can only be determined when the deterioration and loss of stock is taken into consideration.

To ilustrate this, the outbreak of tuberculosis at the Norristown Asylum gives us a maximum case; one hundred cows were shut up in a warm barn; they were fed on ensilage and concentrated food; they gave almost abnormal yields of milk; every attention was paid to items which could in any way increase the milk yield, and so long as no contagious disease found entrance, all went well. But, unfortunately, one or more tuberculous animals were placed in the barn with stock which was entirely healthy, and as a result, the disease spread rapidly, until, by a tuberculin test, over seventy-five per cent. of the animals were infected with the disease, and, in order to prevent its further spread to the uninfected animals, these were condemned, killed and buried. Under the surroundings which are usually met with in the average dairy farm of our State, such loss would not have been incurred. The same infected animals might have been placed among an equal number of cows treated as the average Pennsylvania dairy herd is treated, and, at least during the same time, the loss or infection would probably not have exceeded ten per cent.

If the large number of animals subjected to the danger of the outbreak of anthrax near Tyrone, had been under the trained eye of a veterinarian, the contagion would have been checked after the first few cases, by the removal of the whole herd to other surroundings, as well as by the removal of the prime factor in the outbreak; but the animals had been driven to mountain pastures where they were seldom seen by their owners, and when the assistance of the State officers was finally called, the percentage of loss was great; the prompt removal of the remaining animals prevented further loss, and had this plan been adopted in the earlier stages of the outbreak, great loss would have been prevented.

Many horses are annually lost from cerebro spinal meningitis, and yet a large majority of our horse owners are not aware of the fact that the outbreak and the extent of the loss are largely under their control. In one case which came under the direct notice of the officers of the Board, at least $1,500 worth of animals were lost before the owner realized that his whole loss was directly chargeable to mouldy oats which had been stored against the weather-boarding at the east end of the barn, and which was mouldy to the extent of several inches from the boards. A change of feed at once stopped the outbreak, and no further loss was experienced; and, probably the same owner will never lose animals in the same way again.

An outbreak of Texan fever in the coal regions was reported to the officers of the Board, who, at the time were engaged with four other outbreaks in other parts of the State; by correspondence, it was found that no Southern animals, and in fact, no animal of any kind had been brought into that region, and yet the cows of the cokers were dying from Texan fever, and the loss continued until after the period usually expected from similar infection. The case was an enigma to the officers until the Secretary of the Board made a personal visit, and found that live-stock cars, unloaded at Pittsburgh, had been sent down to the coke regions, where they were cleaned out and loaded with coke for shipment, East. The material taken from the cars had been thrown in a pile, and being warm from fermentation, was used as a place on which the cokers' cows spent the night; an infected car had been sent down with others, and the material taken from it had infected the pile of manure, and the native animals received their infection from this source; the pile was fenced off so that the cows could not obtain access to it, which at once stopped the loss, but had this been known in the earlier stages of the outbreak, loss to those who could illy afford it, would have been prevented.

A lot of swine on their way home from a State fair were found to be infected with hog cholera, and animals to the value of several thousand dollars were lost. Careful investigation showed that a board had been taken from an infected stock car and had been used to close up an opening in the car loaded with prize animals; the person who thus used the board was aware that a large number of pigs were lying dead in the car from which he had obtained it, but being unacquainted with the nature of the disease, he was directly instrumental in causing the whole loss.

These, and other cases which might be noted, clearly prove that surroundings have much to do with the health of our live stock, and that, while certain conditions may and do increase the yield of milk, they may at the same time more than counterbalance this gain by the loss in the health or lives of the animals; and that there is a point in feeding and ventilation beyond which we cannot go with profit, when all the items which enter into the profit or loss are fairly considered, cannot be disputed. We may increase the yield of milk by warmth and high feeding, but we may, at the same time, increase the liability of the stock to disease, and in this way, as before stated, more than balance any possible profit.

If we regard the cow as a machine for the manufacture of butter and milk, we may also compare her to a railroad train and to railroad management, which clearly demonstrates that after a certain speed has been reached, any further increase is at the risk of greatly increased cost and danger of loss to the rolling stock and track; and, in the same manner, we may find that in our dairy practice we have passed the point of the economical product of butter and milk, and have reached that point where the loss to the rolling stock will fully absorb any increased profits.

GLANDERS.

During the year ending June 1, 1894, the Secretary of the Board, under the provisions of the Act of May 9, 1889, condemned 59 glandered horses and ordered them killed. This work included one of the worst and most widely spread outbreaks of this disease with which the Board has had to deal, involving two large livery and boarding stables in the city of Wilkes-Barre, and including 53 animals having an aggregate value of $6,500.00.

The outbreak was practically confined to the stables in which it originated, and resulted in the condemnation and death of 19 animals, having a value, if well, of not less than $2,250.00. The disease was first noted by the proprietors, and they are of the opinion that it was introduced by an animal taken to board, and that it existed unsuspected until the stables and animals were completely infected.

When the attention of the Secretary was called to the outbreak, and the first visit made, a number of animals which had been injected with mallein were found in a hospital established by the Sanitary Committee of the City Council; a number of these animals were clearly infected, and were, under the supervision of the chairman of the local sanitary committee, taken to the flats above the city, killed and their carcasses burned. In this work the Board and the Sanitary Committee of the City Council had the active co-operation of Dr. Harry Walter, who reported the outbreak to the State officers, and who had, by the use of mallein, separated the infected from the well animals.

Finding that the outbreak was being carefully watched and supervised by the local sanitary committee, it was not deemed necessary to appoint any local veterinarian to act on the part of the State, and at no time during the outbreak was it found necessary to make such an appointment. Dr. J. Gross Meyer, chairman of the sanitary committee of council, acted on the part of the city, and the writer, with Dr. Bridge, represented the State in the suppression of the outbreak. Inasmuch as the owners of the animals exhibited a strong desire and willingness to co-operate with the State and city officers, no formal quarantine was declared, and the least possible interruption of business was maintained throughout; the result showed the benefits of this course of action, and much inconvenience to all parties concerned was avoided. Under the direction and supervision of the sanitary committee, a veterinarian watched the stables closely, and when suspicious cases were found, the State Veterinarian was at once called in for consultation, and if necessary, the animal was condemned and paid for by the State and destroyed under the supervision of the proper city officers.

At the commencement of the outbreak, mallein injections were made use of by Dr. Walter for the purpose of developing or diagnosing the disease, with considerable success, but it is believed that what little failure may be charged to the mallein tests, was mainly due to a defective taking of the final temperatures, which was partially entrusted to inexperienced persons, thus, in part, destroying the efficiency of the test by mallein. At periods after the outbreak was reported, Dr. Bridge made use of mallein as a diagnostic agent, but not with as great success as had been hoped for, or as has been attributed to this agent. The evidence deducted from this outbreak is that mallein cannot yet be accepted as an unfailing test for glanders, but that, if properly managed, it is an excellent cumulative test.

The history of the outbreak at Wilkes-Barre leads us to the belief that the exact measure of contagion in glanders varies greatly with the surroundings of the case. In the two stables affected, the animals were well fed, carefully groomed and otherwise taken care of, and while the number infected was much greater than would have been the case with the same number of animals treated as farm horses usually are, yet it is a matter of congratulation to those who had the outbreak in charge that a greater percentage were not infected. As soon as the true nature of the disease was known, every animal, as soon as it showed the first positive symptoms, was promptly killed and the carcass burned; by this prompt action, in which the officers had the hearty co-operation of the owners, much loss was undoubtedly avoided and much time saved in stopping the outbreak.

The history of the various cases which have during the past eighteen years come under the notice of the officers of the Board, distinctly and plainly prove that while suroundings have no power to create the disease, they have the power, the disease having been once introduced, to regulate the extent of its spread and the nature of the outbreak. In numerous cases it has been found that a glandered animal may exist for several years among farm horses or among animals which have sufficient food, proper care and attention and a reasonable amount of exercise without severe labor, without spreading the infection to any great degree, while the same animal introduced into a crowded, ill ventilated stable, in which the animals are insufficiently fed and worked hard, would have, in the same time, infected nearly every animal in the stable.

Dr. Tait Butler, in referring to the danger of the disease, writes as follows:

"Greatly exaggerated ideas are prevalent as to the ease with which the disease may be transmitted from one horse to another. The 'contagium' is not carried far, if at all, in the air and, therefore, it is necessary that a horse come in direct contact with the discharges. Of course, if the discharge becomes thoroughly dried and powdered, it may be carried some distance by the wind in the form of dust, but since thorough drying rapidly kills the germ, the danger from this source is very small. In fact, an animal affected with glanders has been known to occupy a stable for a long time in which were also healthy animals without spreading the disease. Again, a diseased and healthy animal might be driven together for months and yet the healthy animal remain unaffected. But this, however, should not blind us to the true importance and danger of the disease. Its incurable and insidious nature and the impossibility in many cases of making an early positive diagnosis, make it one of the greatest scourges to the equine race, and a source of immense loss to horse owners."

In refering to the origin of the disease, the same authority used the following language:

"There is but one exciting cause, and that is the specific micro organism or 'germ' of glanders. It is called the bacillus mallei, and was discovered by Loeffler in 1882. Up to within the last fifteen years most veterinarians were willing to accept the theory of the spontaneous generation of glanders. It was thought that chronic catarrh or any disease of the air passages would, if allowed to run its course, develop into a case of glanders. This is now known to be a mistake. While we do not know the origin of organized life, we do know to-day that it is not of spontaneous generation, and consequently, since we know that glanders is always due to the action of a living micro organism on the tissues of the animal affected, we are certain that the disease never occurs except as a result of contact with the virus or contagium of glanders."

In addition to this we now know that this germ will soon lose its vitality under certain conditions, and that under certain other conditions, it will multiply with great rapidity; we know that if kept dry and alowed to remain quiet, there is very little danger of contagion; we also know that in damp, illy ventilated stables it multiplies rapidly, and with each multiplication increases the danger of conveyance to the well animal.

TUBERCULIN AS A DIAGNOSTIC AGENT.

When in 1891, Prof. Koch, of Berlin, was treating numerous patients for consumption, and when the use of his "lymph" was at its height, it was not supposed that its use would extend beyond the human race, and it was not then dreamt that it would prove to be a valuable diagnostic agent for the detection of tuberculosis in animals. Among other items noticed as following its injection into the circulation of the human patient, was the characteristic rise of temperature which always followed, if that patient had any of the tubercles of consumption in his system. This rise of temperature was taken as diagnostic of the disease, and that if the disease did not exist, no reaction or rise of temperature would take place.

This fact was made use of in the veterinary practice of Europe, and the supposition that reaction would only take place when the tubercles were present was abundantly supported, and the use of tuberculin as an agent for detecting tuberculosis was established beyond a shadow of doubt.

During the earlier periods of its use many mistakes were made, but all of these could be traced to a want of knowledge on the part of the operator, and they were in no case due to a failure of the tuberculin; carelessness in taking the normal temperatures and the want of a knowledge of facts which have since been ascertained and established, were undoubtedly the causes of many of the earlier errors, and are yet the causes of error on the part of the inexperienced practitioner.

Its use in this country appears to have commenced with the Tuberculosis Commission of the University of Pennsylvania, and Dr. Leonard Pearson, of that institution, used it in diagnosing the disease in the herd of Hon. Joseph E. Gillingham, near Philadelphia, which was fully set forth and explained by Dr. Pearson in a paper read in 1892. In this herd the infected animals were shown by tuberculin, and the correctness of the test was demonstrated by post mortems, all of which supported tuberculin.

Dr. Pearson has furnished us with the following account of the manufacture of tuberculin, and as he was studying in Germany at the time Koch was promulgating his doctrine, the testimony of Dr. Pearson is entled to additional weight and force. Dr. Pearson. writes: "The tuberculin used in this country is made in Germany, and in the laboratory of the Bureau of Animal Industry at Washington; it is all made in the same way, according to the method of Koch.

"This method in brief, is as follows: about 50 c. c. (one and one-half ounces), of an infusion of veal, to which has been added one per cent. of peptone and five per cent. of glycerine, is placed in a flask with a flat bottom and of double this capacity. Upon the surface of this fluid a small cluster of the bacilli of tuberculosis is floated, and the flask kept at a temperature of one hundred, Fahrenheit, for from six to eight weeks. At the end of this time, the entire surface of the fluid is covered with a layer of tubercle bacilli, massed together.

The coating is now examined microscopically, to make sure that it is pure, and the liquid is evaporated by heat to one-tenth of its original volume. This both condenses the liquid and kills the bacilli. It is now filtered through six inches of solid porcelain, and all the dead bacilli are thus removed. This leaves a thick, brownish, coffee colored fluid tuberculin, which has only to be diluted with a weak carbolic acid solution to prepare it for injection."

The use of tuberculin can, perhaps, be best illustrated by the experiment made with the dairy herd of the Norristown Insane Asylum, in which 184 animals were tested and 134 condemned and killed. The test was made by Dr. Bridge, the veterinary surgeon of the Board of Agriculture, and the postmortem examinations were made by Dr. Florence H. Watson, pathologist of the asylum.

In order to obtain the correct normal temperature of each animal, the temperature was taken at 5.15, 7.15 and 9.15 p. m., and at 9.20 p. m. A small portion of the tuberculin was injected in the neck, just in front of the shoulder. The following table prepared by Dr. Watson, shows the effect of the injection upon temperature, taken first after the lapse of ten hours, and after that, every hour for six hours.

Temperature Before Injection.				Temperature After Injection. Injected at 9.20 p. m.					
Herd Number.	5.15 p. m.	7.15 p. m.	8.15 p. m.	7.30 a. m.	8.30 a. m.	9 30 a. m.	10.30 a m.	11.30 a. m.	1.20 p. m.
12,	102.2	102.2	.....	107	108.2	106.8	105.1	.....	.....
111,	101.3	101.3	101.2	106.1	107.1	108	107	106.2	106
31,	104.2	102.4	.....	108	107	106.3	107	107.2	.....
72,	101.2	101.2	.....	108	108	106.3	106	106	.....
27,	103	103	.....	105.2	106.1	106.2	107	106.2	.....
99,	101.2	101.2	101.1	106.4	107	107	.....	.....	.....
5,	101.2	101.2	101.1	107	107	107	.....	.....	.....
80,	101.2	101.2	101	106.4	107.1	107.1	.....	.....	.....
26,	102.3	102.3	103	105.2	106 2	107.1	.....	.....	.....
4,	102.2	102.3	102.1	104	105.1	107	.....	.....	.....
37,	101.3	101.2	101.1	105.4	107.1	107.1	.....	.....	.....
11,	102.4	102.2	.....	107	106.2	107.1	107	.....	.....
97,	101.3	101.1	102.1	105.2	106 3	107.4	107.2	106.1	106.2
96,	102.3	103	102	106	107	106	107	106.2	105
93,	102.3	103	102	104	105	106	107	107.3	106.3
113,	101.1	101.2	101.2	104	105	106	107	108.4	104.3
75,	102.1	102	.....	106 2	107.1	107.1	107.2	.....	.....
1,	102.1	101.2	102.2	105.2	106.3	107	107.2	107.1	106
70,	101	101.4	101.1	103	104.4	106	107	106.3	105
90,	101	102	101.4	104.3	106	106.1	107	107	105.2

(Where the temperature after injection is omitted, the animals had been killed.)

This table necessarily embraces only animals which were infected and condemned, as the injection produced no visible effect upon animals not affected; and for the purpose of illustration, it also contains some of the worst cases found in the herd; its results would appear to indicate that, at and after the expiration of the twelfth hour after injection, the temperature has passed its highest point, and gradually falls again to normal, but it also shows that this normal temperature was not reached at the expiration of the thirteenth hour after injection, and that, in fact, even at this time, a few of the animals still showed a rise in temperature.

Other experiments made by the Board and with other herds, seem to indicate that the temperature may be taken in eight hours after the injection, but that the taking of the temperatures should be kept up for several hours later, as there appear occasionally to be animals which react slowly and which, if the earlier temperatures only are taken, may be missed entirely.

The experience of the officers of the Board, in the administration of this test to more than 1000 animals, appears to clearly prove the following points:

1. That in proper and capable hands, tuberculin is a safe and sure diagnostic agent for tuberculosis, and that in all the cases coming under out notice, not a single error has been shown, although all cases of condemnation by this agent have been followed by careful post-mortems.

2. That great care is absolutely necessary in obtaining the normal temperatures of the animals. We usually start out with the intention of condemning all which indicate a rise of two and one-half degrees or more, and inasmuch as the normal temperature varies somewhat with the time of day, the season and the time of feeding, some animals showing a considerable elevation of temperature at the time of feeding, but failing to show any further elevation under the action of the tuberculin, and it is therefore very important to obtain the average normal temperature without its being influenced by surrounding circumstances.

3. This need of care is further implied by the fact that if an in-

jection is made in an animal known to be affected with tuberculosis, we may entirely fail to get a great difference between the normal and the elevated temperature; in some cases of this kind, we have failed to obtain an elevation of even one degree, and in others, less than two degrees, although any one could detect the symptons of the disease, externally.

4. In such cases, however, the observant practitioner is protected by the fact that the first temperature taken is two or three degrees above the normal, and that if the elevation of temperature is compared with the average normal temperature of the herd, the expected rise of two degrees or more is obtained; it is probably at this point that a novice may make an error, and pass animals which should have been condemned.

5. There appears to be no connection, whatever, between the rise in temperature and the amount of disease or diseased surface in the animal tested; thus, in the Asylum herd, No. 111, which gave the extraordinary elevation of one hundred and eight, or nearly seven degrees above her normal temperature, showed the least amount of disease, while some of those showings a large amount of tubercles, gave the lowest reaction.

6. The above fact may possibly be accounted for upon the supposition that the minute amount of tuberculin used may not be able to extend its influence over a large amount of tubercular surface, and that, from this cause, we do not obtain the reaction. But experiments appears to demonstrate that under ordinary circumstances, the amount (within certain limits), of tuberculin used, does not appear to regulate the raise in temperature, and that as high temperatures are obtained by the use of the minimum amount as with a larger amount.

7. That a cow in heat will often show an increase in temperature, which, after a tuberculin test, and without care and observation upon the part of the practitioner, might lead to her improper condemnation and death; that errors have arisen from this cause is undoubtedly true, and is but another proof of the theory which we have advanced, that the normal temperature should be guarded against other influences.

8. That as the cow more nearly approaches the period of calving, her temperature will rise, and that, in some individual cases, this rise has been sufficient to cause an error on the part of the incautious observer, who blindly condemns on a rise of a given number of degrees, without noting the surrounding circumstances.

9. That exposure to the hot sun, long continued confinement in an illy ventilated building; unusual changes in feed, especially from green to dry feed; failure to water at usual time; and in some nervous animal, any exciting cause may produce more or less variation from the normal temperature. As demonstrating these special points, in testing a herd in Juniata county, in which several animals were condemned, some calves brought up out of a hot field, where they had no water, were found to indicate an average normal temperature of 105 degrees, which subsequently after confinement in a cool stable, with both feed and water, fell to 101 and 101.5 degrees.

10. That a failure to secure reaction in animals afterwards found to be tuberculosis, may be due to the location of the tubercles; thus for instance, if a large mass of tubercles, as is often the case, are lo-

cated in or among the intestines, and yet do not exist in sufficient numbers to cause external evidences of their existence, there may be no corresponding elevation of temperature, and the case may possibly be passed by even by a comparatively careful practitioner, but it does not prove the inefficiency of the tuberculin test.

11. That, at least so far as the officers of the Board are concerned, the use of tuberculin has not produced tuberculosis in healthy animals; in several cases the remainder of herds from which individual members have been condemned, fail, on retests, to show any signs of the disease, thus apparently proving that there is no danger in the use of properly prepared tuberculin; but it does not disprove the fact that improperly prepared tuberculin may prove dangerous, by creating the disease where it did not previously exist.

12. That the careful examination made by officers of the Board and by those even more competent who have co-operated with them, appears to prove that a certain percentage of the animals condemned by the tuberculin test may recover, but as there is no possible means of knowing which these are, the killing of all indicated by the test is the only sure means of clearing the disease from a herd.

13. The use of tuberculin by inexperienced persons is likely to bring it into disrepute as a diagnostic agent, and, as is usual, one failure will produce a greater effect upon a community that twenty successful tests. The opportunities for errors, are, as has been shown above, sufficiently numerous as to readily mislead the uninitiated observer, and animals will no doubt, in the miscellaneous use of the test, be condemned without cause. and infected animals escape condemnation entirely.

14. That in badly infected herds, a physical examination may enable the veterinarian to put aside a certain percentage of animals as evidently diseased; after this, a careful tuberculin test will condemn forty or fifty per cent. more. In the herd of the Norristown Insane Asylum, it is probable that a careful, physical or external test would have condemned possibly 30 animals, while the tuberculin test condemned fully that many which would otherwise have escaped condemnation.

15. An external test is mainly applicable to cases in which the tubercles are located in the lungs, and there may be, as has been demonstrated by the Norristown herd, cases in which large masses of tubercles may exist in the intestines without producing any prominent external exhibition of their presence, and that it is with such cases that the tuberculin test is most valuable.

16. The causes which may produce a rise in temperature, without the injection of tuberculin, may be enumerated as follows: Near approach of calving, which, with some animals, will give a rise of temperature which may mislead.

Variations in feed, especially from green grass to dry feed, without sufficient water; errors in this direction have been brought up off green pasture and confined in a barn, on dry food, while the test was in progress.

With nervous animals, the excitement due to the presence of strangers and the attending surroundings, may cause an elevation of temperature, which, however, from its low rate, should not mislead a careful observer.

In fact, any sudden variation in the treatment of the herd may cause a rise in temperature, and if this is not taken into the account it may, at least partially, mislead.

TUBERCULOSIS POINTERS.

1. "There is, in the first place, a certain but not always well defined loss of activity; there are periods in which the animal will seem dull, and many cows cannot be made to breed easily, while it is not at all uncommon for many of them to be almost continually in heat. The appetite is good and the cow will fatten fairly or give a good yield of milk. With these cases there is apt to be an occasional cough, dry, deep and feeble, that is especially shown when there is, from any cause, any sudden change in temperature, or when the barn is first opened in the morning. The cough is also noticed when the animal exerts herself somewhat, and it is not at all a bad practice to run a suspected cow for a few minutes to see if she will cough; if this is done immediately after she has been drinking water freely, it will be especially likely to produce the cough, if the disease is present.

The symptoms of what may be called the secondary stage are emaciation, dull countenance, sluggish movements, skin dry and adhering more or less tightly to the ribs (hide bound). The hair is dull looking, coat rough and not infrequently feels damp to the hand. Slight exertion causes rapid breathing and cough if the lungs are affected. The appetite is fickle or diminished; there may be constipation or diarrhoea, or the two conditions may alternate. The milk is somewhat diminished in quantity; the cough comes without apparent cause, or is easily induced by pressure upon the upper part of the windpipe. The breathing, rather increased in frequency, is sometimes accompanied by a little double expiratory effort, as if the animal stopped breathing for a second and then finished expelling the remainder of the air from the lungs before taking in the next breath.

In the third stage, the cow is very thin and very much debilitated. The appetite is very fickle or almost lost, and there is more or less fever which, however, is not evenly maintained through the twenty-four hours. The cough is frequent, and the head is held in a line with the back, or lower. When the animal coughs, the mouth is opened and the tongue protruded; the breathing is short and irregular. There is very often diarrhoea, with bad smelling, dark colored discharge."—*Dr. C. B. Lyman, Boston, Mass.*

2. "Tuberculosis is, in many respects, allied closely to glanders, and its distribution and character are modified by similar influences. In both diseases the course and duration is indefinite; the bacilli, arranging themselves in groups in various tissues and organs, become encapsuled and eventually tend to perish therein. Both affect largely, both primarily and secondarily, the lungs, and both attack preferably the

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(Note: The general desire of our correspondents for any information relating to tuberculosis has caused the Secretary to collect the following from various sources. Care has been taken to give the author due credit, and the Board assumes no responsibility for the theories advanced. *Secretary*).

lungs of those individuals among susceptible species, other environments being equal, in which these organs are not constantly very active, but contain at some, if not at all times, a large amount of residual air. High altitudes, with consequently dry atmosphere, bring about special chest development and require for the sustenance of life a much more complete and active respiration, and permit much less residual air. Post mortem examinations of glandered horses at high altitudes have thus far, in my experience, indicated a much less development of pulmonary tubercles than in lower altitudes in like severe cases. Close stabling without exercise produces results quite parallel to low altitudes with humidity, hence where the two are combined, we would expect and do find the greatest prevalence and most virulent type of tuberculosis, while in the high altitudes, with dry atmosphere, it is unknown except as directly imported."—*Prof. W. L. Williams, Bozeman, Montana.*

3. "While this agitation regarding the prevalence of tuberculosis among cattle is a legitimate and proper one, we should be guarded in our assertions, and confine ourselves to statements of fact. Some there are who dwell upon the great danger resulting to the human family from the consumption of meat and milk, a danger that has been exaggerated out of all proportion, and, if continued, will result in the closing of all foreign markets against the beef and dairy products of this country, for it will lead foreign nations to believe that all our herds are largely tuberculous. We ought to be just toward ourselves, and avoid magnifying a fact that is sufficiently serious to be worthy of our attention when viewed in the light of truth.

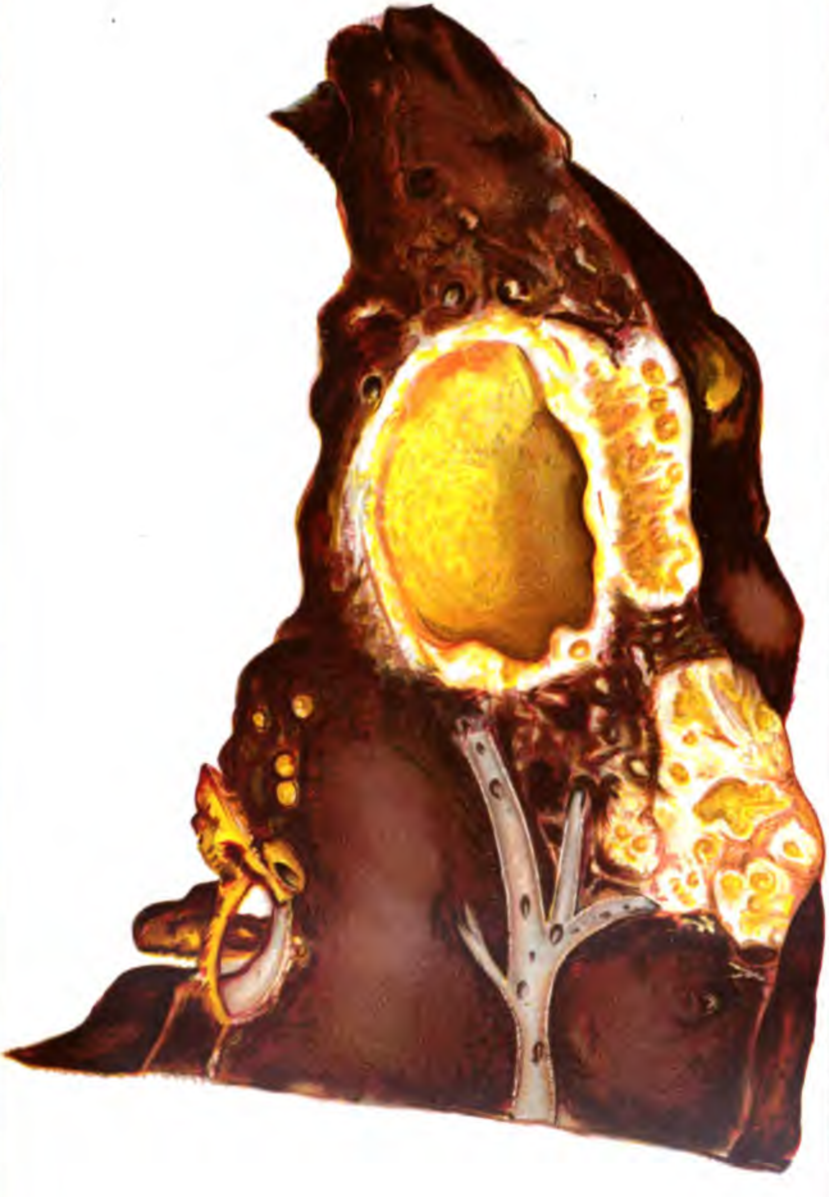
"Why lay blame upon milk from cows by the wild presumption that many thousand infants die annually from intestinal tuberculosis, the result of milk infection, when it is acknowledged that seven per cent. of the human family is consumptive? Does it appear right?

"How many cases are recorded when cow's milk was the known cause of such a fatality? Very few.

"Does it not appear to you that we are attempting to make a scapegoat of the useful and almost innocent cow? Again, I say, we are not yet ready in the west to adopt radical measures for the suppression of a disease that does not prevail to any alarming extent among our herds."—*Dr. M. R. Trumbower, Sterling, Ill.*

4. "The sole and exciting cause of this disease is a germ called the bacillus tuberculosis. It is a parasitic, microscopic, rod shaped plant which lives in the animal body, has great vitality, resists heat, cold, moisture, drought, decay and often the process of digestion. It is killed by boiling, by long continued heat at from 150 to 170 degrees, as well as by sunlight, air and certain chemicals. Infection occurs by breathing the germs; by swallowing the germs; by their entrance through a cut or wound. The main sources of infection are: The dust of the dried spittle of consumptives or other tuberculous matter, either breathed or swallowed: contact with tuberculous material or people; the meat and milk of tuberculous animals.

"The bacillus tuberculosis is the sole cause of the disease, but there are conditions so favorable to its development that they are well termed accessory causes, although strictly speaking, they are not causal. Among these conditions are: Hereditary predisposition; unhealthy surroundings, poor ventilation, uncleanly, dark, damp, hot and cold stabling, soiling system, lack of exercise, climatic influences;



TUBERCULOSIS.

LIVER.—Median section showing tubercular nodes and abscess cavity.
Cow No. 95—Asylum Herd.

faulty feeding, under feeding, over feeding, feeding on unwholesome or indigestible materials, over production; faulty breeding, in and inbreeding, early, late and frequent breeding, intensive breeding, lack of constitution; ill health, temporary predisposition; physical constitution."—*Drs. Hills and Rich, New Jersey Experiment Station.*

5. "The tubercle bacillus is killed by a temperature of 158 degrees F. for ten minutes; it dies in a few hours in direct sunlight, and in five to seven days in diffuse daylight. In an ordinary room it gradually weakens, but remains virulent for at least ten weeks. Galtier found that the bacillus tuberculosis was preserved indefinitely in springs, ponds and wells at all ordinary temperatures. Hence the danger of common drinking troughs, of streams that have run past infected herds, or the places where their manure has been put, and of soil that has received the manure or carcasses of the diseased.

"It would seem as if the muscle or red flesh in cattle was antagonistic to the bacillus tuberculosis. Certain it is that tubercles are rare in the substance of the muscle. They are, however, very common in the lymphatic glands lying between the muscles, and in swine they are common in the substance even of the red flesh. The flesh of tuberculous pigs is, therefore, far more dangerous than is that of consumptive cattle. Even in tuberculous cattle, however, the beef is not always free from bacilli."—*Dr. James Law, Ithaca, N. Y.*

6. "The total number of animals which I tested up to August 17, 1894, was 816 head, and out of this number 351 have been killed and post mortem records kept of same. Out of the 351 killed, there were six which did not react, but were killed on the strength of a difference of opinion. In five of these cases there was pneumonia. The sixth one had a very marked dullness of one lung, a cough, and was also emaciated. We found a piece of wire had penetrated the lung.

"Out of the 345 cattle which reacted, I have to record one failure, that of Mr. J. Gilbert's. The only thing found diseased in this cow was where wire and nails had penetrated the paunch. At this place there was a hardened bunch, which might have shown the tubercular bacilli if examined with the microscope. I had a very narrow escape from a mistake in two calves of John D. Wing's, which showed marked reaction, in which we found numerous small black tumors all through the mesenteries. Professor Law, who witnessed these post mortems, took these small tumors and inoculated rabbits, and on the 15th of June, 1894, at a meeting of the tuberculosis committee, Professor Law told me that these rabbits proved to be tuberculous.

"As to the disposition of slaughtered animals, my plan has been wherever it was possible, to cremate. For this I first get a large quantity of brush, and on this pile a lot of cordwood. I then make a run and draw the carcasses on top of the wood, piling them up. I then saturate the carcasses and wood with kerosene oil; a half barrel of kerosene will be sufficient for from fifteen to twenty head, and will do the work well.

"In stamping out the disease if we cannot get the aid of the government for compensation, and the losses are too great for the owners to bear, then separate the well cattle from the diseased.

"Disinfection is just as necessary as the destroying of the cattle. For this, first sweep, then wash with boiling water and soda, allow to dry, then use bichloride of mercury and wash thoroughly with it. Make solution 1 to 500."—*Dr. J. Faust, Poughkeepsie, N. Y.*

7. "Generalized infection, both chronic and acute, has obtained considerable attention, owing to its important bearing on the infectiousness of meat and milk. In all cases of generalized disease, the milk should be regarded as dangerous. The difficulty, from the practical standpoint, lies in the recognition of the generalized infection during life. With the meat the question is simple and resolves itself into the thorough inspection of every carcass at the abattoir by a trained inspector, and with the living animal there are only a few guides, such as the condition of the udder lymph, or enlargement of some of the superficial glands.

"The regions of the throat and of the small intestines are more likely to absorb tubercle bacilli early in life than later on, while the lungs seem to become with age the preferred seat of the disease. Demonstration of this assumption is complicated by the fact that calves are more exposed to food infection than adult animals, because of the dangers of tubercle bacilli in the milk. There is every reason to believe that most of the tuberculosis of cattle is not demonstrated at or before birth, but is contracted by contagion later on in life. Cattle owners should pay special attention to the condition of udders, disease in which is particularly dangerous, because the milk at first appears normal for some weeks, and therefore would be used with impunity. With this disease the only danger to other herds lies in direct contact, or in the transfer of a diseased animal, or of milk from such an animal. The greatest danger exists in the immediate surroundings of the infected, and loses itself as the distance increases." —*Prof. W. L. Williams, Bozeman, Montana.*

8. "That the disease may be transmitted in the opposite direction, i. e., from animals to man, has also been shown by numerous unfortunate accidents, some of which have terminated in the death of the luckless subjects. Two years ago I became accidentally inoculated in the hand while making an autopsy on a tuberculous cow. As the disease was recognized in its early stages, it was cured by a simple operation. In Germany, even the flesh of tuberculous cattle is destroyed, or is thoroughly cooked before it is allowed to go on the market. Tuberculous milk is recognized as being far more dangerous to health, because it is consumed in the raw state and is fed so extensively to infants and invalids.

"Pathologists inform us that tuberculosis of the intestines is not rare in children when the breathing organs are healthy. This leads inevitably to the conclusion that the disease was contracted by eating infected food—and what food other than milk? Then, cases might be cited in quantity to show that people with good family history have died of intestinal or other forms of tuberculosis, where practically every form of infection except contaminated food has been excluded." —*Dr. Leonard Pearson, University of Pennsylvania.*

9. "You know that dairymen found out that they get more milk by keeping their cows in-doors. Experimental stations have been teaching this, and this point has been overdone. Nothing reduces more the vitality of the animal and the inherent resistance to diseases than lack of exercise. This is one of the reasons we find so many fat cows tuberculous.

"To these deductions I most heartily subscribe, and have especially noted for a long time the pernicious teachings of some of our experimental stations, founded by our government for the purpose, among other things, of fostering our live stock and dairy interests, which by this pernicious teaching they are constantly tending to destroy by destroying the vigor of our cattle. They teach that a cow yielding twenty or thirty pounds of butter fat per week is exercised abundantly by secreting milk. These stations are founded for scientific experimentation, but there is no science in such teaching.

"I admit that in a short space of time more milk and butter fat can be taken from a cow with a given amount of food, but the process is contrary to all physiological and hygienic laws, and constitutes an enormous drain upon invaluable reserve forces which we can never replace."—*Dr. Schwarizaph, Chicago, Ill.*

10. "Of our domestic animals, cattle are the most susceptible to it, having it in all forms. Horses are not often found with it in the lungs, but, if at all, it is in the glands, adjacent to the intestinal tract. Pigs are sometimes affected with it; sheep, dogs and cats are rarely affected, while rabbits and guinea pigs are especially susceptible, making them good subjects for experimental work. In fowls the tubercles are frequently found in masses upon the liver and intestines, sometimes of a horny nature.

"There are a number of diseases now known to be tuberculous which were formerly not supposed to be connected with it, such as the disease called lupus, chronic suppurations or abcesses, chronic inflammation of the joints, white swellings, hip disease, enlargement or that affecting the lungs, also the intestinal tract.

"Inhalation is the most frequent means of infection. The virus is given off from the animal in fluids or solids. While moist it cannot rise in the air, but dried and as dust it is easily carried by the air. The inhalation of the dust produces an inflammation or bronchiolis, and the tubercle bacilli accompanying the dust find in the inflamed tissue a good medium in which to grow. Out of thirty-eight inoculations of animals with dust of hospital tuberculous wards, only four failed. Out of sixty-two inoculated with dust from phthisical patients' rooms, only six failed."—*Dr. H. M. Briggs, New York.*

11. "Prof. Russell says: 'An outbreak of a few cases of small-pox suffices to produce alarm in every neighborhood, but when one in seven human beings that die falls a victim to consumption, the great mass of people observe with helpless apathy the condition of affairs and take no heroic measures to lessen its prevalence. * * * The manner in which the disease is contracted by man is mainly by infection of the air passages and infection by the intestines. Dr. Shakespeare asserts that the mortality among infants and young children from tuberculosis, especially in large cities, is far greater than has been believed, amounting in some instances to twenty per cent. of all deaths. It is significant also, he says, to note that the disease appears very frequently in the digestive tract or adjoining organs. The danger arising from the consumption of tuberculous meat is, however, very much less than that from milk, meat being generally subjected to a degree of heat sufficient to kill the germ, while milk is more often used in the raw state. This being the case, the opportunity for the transmission of the disease by milk, especially to children, is much greater than by meat. So that, while tuberculous cattle may not always transmit contagion in their milk, the possibility of such a result must always be considered. The chance of accidental contamina-

tion of food and drink is very slight compared with the possibility of contracting the disease by the use of diseased food or drink.' "— *G. Rhyfedd Foulke, West Chester, Pa.*

12. "We draw radical conclusions on insufficient data. Possessed with a new idea, society makes it the consuming theme until it is worn out or tossed aside as a child does its plaything, or until a new notion usurps the field occupied by the departing guest. It certainly is not shown that tuberculosis—a contagious disease, has its origin for a single individual in the silo, or that the silo is the inducing cause. It is not even shown that tuberculosis is on the increase in the bovine family. The presumption is that there is less of it, as consumption is on the decrease in the human family, while it is probable that milk is consumed in larger quantities than ever before. The matter of tuberculosis is practically a new discovery, and the fact that the human family may take it from cows is a just cause of alarm and of agitation. It is a cause of regret that some of our stock papers try to throw discredit upon the matter, especially those that are patronized by the breeders of pure bred stock. It is useless and hardly honest to try to disguise the fact that cattle that are confined in the barns, made warm and therefore tight, excluding the air in sufficient quantity, are in conditions most favorable for the spread from animal to animal of this dread disease. What we should do is to find the facts, and then we can, in the interest of good animals and their owners, too, create conditions that are favorable to them. Deceiving ourselves is not the best preparation for inauguration of the right remedial methods."—*Prof. J. W. Sanborn, Utah Experiment Station.*

13. "There is not a single American or European city of which we possess reliable statistics, in which there has not been a gradual diminution of this disease. This is not only so since the discovery of the tubercle bacillus in 1882, since which greater care has been exercised through fear of this disease, but it obtains as far back as the records go, which in the case of New York City, extends back to 1820. Indeed, the health records of Philadelphia show that the average death rate from consumption during the nine years immediately preceding this discovery of the tubercle bacillus, was a fraction less than it was in the nine years immediately succeeding this discovery.

"Furthermore, statistics also prove that the death rate from this disease is not any less in the German cities of Berlin, Hanover and others, where a rigid meat inspection has been enforced for years by the government, than it is in Boston, New York, Brooklyn, Philadelphia, Albany and Baltimore, and other American cities, where such measures have received very little attention so far.

"It is entirely foreign to my purpose to advocate the sale of diseased meat and milk in any form, but in a scientific discussion, I insist that we ought to call things by their right names, and so avoid the danger of alarming and inflaming the minds of the people on the score of insufficient premises.

"Let us get our food supply as free from contamination as possible, but let us not conclude, contrary to facts, that consumption does not decrease because we are all eating and drinking tubercles in our meat and milk."—*Silas Betts, Philadelphia, Pa.*

14. "Tuberculin is simply the soluble poisons produced by the growth of the tuberculin bacillus in suitable mediums, whether in

animal body or in flasks, then sterilized by such heat as will destroy all vitality within it in the liquid. It is filtered through a Pasteur filter, which nothing solid will go through, nothing but chemical poisons, so that even the dead bacilli are filtered out. Then it is concentrated to about half its bulk, and in that condition it is used. This is what is present in the system in tuberculosis, produced by the growth of the tubercle in a body. This poison, circulating in the animal fluids, brings about the general action of fever. In mild or occult cases of tuberculosis, the production of this is comparatively limited, and the system accommodates itself to the amount that is continually produced by the tubercles; but if we add a little more, it gives a jog to the process by adding the poison that is the primary cause of the disorder. The result is an increase of the growth of the tubercle and a febrile reaction. It is upon that we trust to make out those cases of hidden tuberculosis which we cannot make out by ordinary examination, and it is very, very reliable. In hundreds of cases where I have applied it, I cannot recollect a case in which I have been misled—that is, using judgment to see that there was no other contending cause for a rise of temperature at that time. It is simply adding a little to the poison which the growth of the bacillus produces in the system. If the system has become accustomed to the poison, so that it no longer reacts, then the reaction is still brought about by adding a little to this poison. In a healthy system the small dose we use produces no reaction; in a diseased system, the active process of tuberculosis or the growth of the tubercle is accelerated, and with that is developed this increase of fever for a period usually extending from the 8th or 10th to the 15th or 24th hour thereafter."—*Dr. James Law, Cornell University.*

15. "There are three methods of infection:

By inhalation (breathing the germs into the lungs).

By ingestion (swallowing the germs).

By inoculation (the entrance of the germ by some channel other than the lungs or stomach, as, for instance, through a cut or wound).

There are three general sources of infection:

The dust of the dried sputa of consumptives or other tuberculous matter, either inhaled or swallowed.

Contact with the tuberculous material of those suffering from the disease, thus becoming infected either by inhalation, ingestion or inoculation. (For example, in kissing a tuberculous person, there might be danger of either ingestion or of inoculation with the tuberculous sputa).

The meat and milk of tuberculous animals.

Among the conditions favoring the development of tuberculosis, if the tubercle bacillus is present, are:

Hereditary predisposition.

Unhealthy surroundings; poor ventilation; uncleanly, dark, damp, hot and cold stabling; soiling system; lack of exercise; climatic influences.

Faulty feeding; under feeding; over feeding; feeding on unwholesome or indigestible materials; overproduction.

Faulty breeding; in and inbreeding; early, late and frequent breeding; intensive breeding; lack of constitution.

Ill health. Temporary predisposition.

Physical conformation."—*Dr. F. A. Rich, Vermont Experiment Station.*

16. "In the first case, the bacilli gain access to the delicate air cells of the lungs by the ordinary processes of breathing. The virus of the disease in a dried condition retains its vitality for months, so that germ laden air taken into the lungs finds in this susceptible organ favorable conditions of development. The earlier stages often pass unnoticed, and soon the victim is firmly in the grasp of the disease and beyond human aid. To this source of contagion is to be ascribed the greatest importance, for by far the greater number of cases contract the disease from this source. So long as the sputa of consumptive patients is voided indiscriminately and allowed to dry and mix with the dust, just so long will consumption ravage the human race.

Now as to the second method of infection, by the way of the digestive tract. Fortunately, indeed, for humanity, the intestines are less susceptible to this disease than the lungs. In adults a primary infection of the intestine is rare. It may happen, however, as a secondary infection where quantities of bacilli that are coughed up from the lungs are swallowed and in the already enfeebled condition of the body, the intestines prove unable to cope with the disease germ. In the case of children, the intestinal tract is much more susceptible to the disease, so that the danger of infection is very much greater than in the case of adults. Dr. Shakespeare asserts that the mortality from tuberculosis among infants and young children, especially in large cities, is far greater than has been believed, amounting in some instances, to twenty per cent. of all deaths. It is significant also, he says, to note that the disease appears very frequently in the digestive tract or adjoining organs. Woodhead found that in 127 cases of tuberculosis among children, forty-three showed an ulcerated condition of the intestines, while 100 cases, or 70 per cent. showed tubercular degenerations of the glands of the intestine and adjoining organs."—*Dr. H. L. Russell, Wisconsin Experiment Station.*

17. "From what we know by analogy of germ investigations in general, we might expect that the varieties of tubercle and of consumption are due entirely to individual peculiarities of the person reacting on one species of germ. Thus, the germ of quick consumption, when transplanted into another person, need not produce this variety of disease, and similarly, the germ of chronic tubercle, in all likelihood, does not change its nature when transplanted into a person who, as a result, suffers from quick consumption. It is rational to believe that when a person who has suffered for years from the "slow" variety suddenly develops the "quick" variety, that his constitution has finally given up the struggle. We all give up the struggle of life sooner or later, and these germs are only a specific form of the varied forces that cause death universally. The burden of proof lies with those who assert that there are various distinct species of consumption germs. Some tubercles, which are produced apparently without the agency of germs, may be due either to ultra-microscopic spores, or the germs may have disintegrated, possibly forming spores, which we know are difficult, if not practically impossible, to demonstrate in certain cases.

The germ of tuberculosis in animals differs slightly as to size from that thrown up in the sputum of consumptives, yet the characteristic forms of tuberculosis have repeatedly been produced in animals inoculated with tuberculous germs taken from man, and from other species of animals at will. Science has, indeed, shown that other germs, as in actinomycosis, for example, do produce forms of tubercle that have been mistaken for tuberculosis, but the same science that demonstrates this specific difference is competent by means of similar methods, to pronounce upon the question of the unity of the disease, tuberculosis. While we admit that the question is not finally closed, we must act on the evidence already in, and that evidence is in favor of such unity."—*Dr. Julius Nelson, New Jersey Experiment Station.*

18. "My plan in investigating has been to have the cattle placed in the stable at 5 p. m., initial temperature about 7 p. m., and inject tuberculin at 10 p. m., and then start to take the temperature at 6 a. m., 8 a. m., 10 a. m., 12 . and 4 p. m., and longer under circumstances. The animals to be tested are to receive no food or water from 5 p. m., until 5 p. m., the next day.

"One fact in taking the temperature—make all the cattle stand, as all cattle defecate shortly after rising. This will probably save you many thermometers.

"The preparation of tuberculin is accomplished in the following way by me:

"Eighteen and a half drachms of one per cent. solution of carbolic acid (using distilled water) and one bottle of Koch's tuberculine, which makes 20 drachms of solution. Inject from 20 to 60 drops, according to age and size of the animal. Injection to be made in centre of the shoulder. In cows you suspect of chronic or tubercular mammae be sure and use the full dose as they are hard cases to get reaction.

"The question has arisen in regard to what rise we shall consider a cow tuberculous. In the year 1893, we, as inspectors of New York State, were instructed not to kill any cattle unless we had a rise of 2½ per cent. or upwards, but I am frank to say that many cases of tuberculosis was left behind, which I have since been called to kill, and hold post-mortem, and found them tuberculous. I found where there has been a steady rise of one per cent. or upwards, these cattle are very suspicious, and generally are tuberculous. I should strongly advise to isolate them for a second investigation." — *Dr. J. Faust, Poughkeepsie, N. Y.*

19. "Tuberculosis occurs in cattle wherever they are kept in domestication, but seems to be most prevalent where consumption is most common in the human family. It is almost unknown in Iceland, and is very rare in Polar countries generally, but increases as we approach warm climates. It appears to be very common in Italy and Algeria; and, acording to Fleming, it is becoming more common in England. I am not able to give any estimate of the prevalence of this disease among the herds of Massachusetts, but my attention has been called to it so frequently during the past two years, that I am inclined to believe that the disease is more common than is generally supposed. On two occasions I visited one of our large city meat markets, and examined the lungs still attached to the livers offered for sale, and the superficial examination which I was able to make, led me to conclude that nearly half of them showed traces of the disease.

It seems from all we can learn, that a cold climate is less favorable to the development and propagation of tuberculosis than a warm or tropical one. Veith states that the disease does not occur in animals living in a wild condition, nor even in those which are in a semi-savage state. Spinola confirms this statement, and adds that the affection is unknown in the Russian steppes, and is rare in elevated regions. According to Zippelius, tuberculosis is most frequently developed in deep and narrow valleys, or in densely populated localities. The disease causes the greatest revages in damp and dark dwellings with imperfect ventilation and drainage."—*Dr. C. H. Fernald, Hatch Experiment Station.*

20. "The action of tuberculin upon the tubercle bacillus is that of an excitant. It arouses the germs to increased activity, hastens the progress of the disease, tends to scatter the infection throughout the body and throws the animal into a feverish condition, as shown by a rise of bodily temperature of from 2 degrees to 8 degrees F. The tubercular tissue degenerates rapidly through the usual stages, the germs rapidly increase in number, a new extension of the disease in the form of acute miliary tuberculosis usually occurs and death by so-called "quick consumption" ensues. This action is what brought Koch's lymph into disfavor as a cure, except in cases of lupus (tuberculosis of the skin) and other localized forms of the disease where the diseased tissue is sloughed off. But the very features which prohibit its use as a cure, are those which give it its value as a diagnostic agent means of determining a disease by distinctive marks, symptoms or characteristics) in cattle. The tuberculous animal because of the very presence and action of the tubercle bacilli in its system, becomes more or less charged with tuberculin. The system is injured to this, however, but it is supposed that its balance is upset by the injection of more tuberculin, the germs are excited to greater activity and fever ensues."—*Dr. J. L. Hills, Vermont Experiment Station.*

21. "Just how this peculiar condition of body is produced, we do not always know, but it seems that when an animal is constantly subjected to a system of treatment that demands a considerable amount of vital force for its accomplishment, she is by that act especially open to an attack of this contagion. Such treatment will include, among its most common operations, the frequent bearing of young, and the strong feeding which is undertaken to produce a large and long-continued flow of milk. This system is so largely followed by dairymen that the great wonder is that the disorder does not prevail to a greater extent among cattle of this class than it does in certain localities.

Another cause that will, after a while, create a decided condition of receptivity, is due to badly managed in-and-in breeding, as a result of which some one noted and valuable trait, as an immense amount of beef or a tremendious flow of milk, is reproduced in the offspring, at the expense of the soundness of other organs of the body, with a sureness that is only equalled by the certainty with which the disease shows itself in individual after individual of the race.

Another cause, and the greatest one of all, is the breeding from animals which are themselves victims of tuberculosis. This, in itself, is not apt to produce the disorder; but it does produce an animal that has external strong "predisposition" to enter upon a state of receptivity; that is, to get in the peculiar condition that makes its body an exceedingly well-prepared and fertile soil for the implantation and growth of the seed (contagion), of tuberculosis. The fact that such animals are more open than any others to an attack of this contagion, is a further indication that there is something beyond a mere poor or "run out" condition necessary in its production; and that this "something" is reproduced in breeding with as much certainty as are other more easily recognized and more valuable family peculiarities." —*Dr. Charles Lyman, Boston, Mass.*

22. "These glands include the under and lymphatic glands, the glands at the base of the ear and under the jaws, above the stifle, front of the shoulders, and others which are located internally may become the seat of the disease, and when so, they usually swell more or less, and if located around the throat, will cause a wheezing sound. The udder, if only one quarter is affected, becomes hard and swollen in some cases; if the whole of it should be affected, the swelling would extend. The disease, however, may exist in any of the glands without producing swelling, so that it is not safe to say that the udder is not affected if it is not swollen. The affection of the glands above described is hard to diagnose in most of the cases, and if there is a suspicion of tuberculosis in the herd, one should not wait for the development of any of the symptoms given, but should have a thorough examination made in the manner which will be described

In young animals living on milk from tuberculous cows, the intestines, liver and spleen often become attacked, giving rise to indigestion, diarrhoea, and bloating; and if the animal should live long enough, other organs may become affected. In older cattle when the disease attacks these organs, the same symptoms are noticed, but do not usually cause so rapid emaciation. One case that I can call to mind that died from tuberculosis of the intestines, was, in fact, in fair condition, to all appearances being fit for beef at any time. Death was the result of a rupture of the intestines, and on post-mortem showed nearly the whole length of the intestinal tract to be the seat of the disease, there being two tumors weighing respectively five and seven pounds each, attached to the small intestines. From their appearance we should judge that the animal suffered at least six months to a year before succumbing to the disease. A physical examination three weeks previous to death did not offer sufficient symptoms to diagnose the disease."—*Dr. T. D. Hinebaugh, Dakota Experiment Station.*

23. "Board up the partitions of the stalls at the front so that no two cows can feed from the same manger nor lick each other.

Keep each animal strictly by its own stall and manger.

When any animal is suspected, don't let it use a drinking trough or bucket in common with other animals.

Avoid old milk cows and unthrifty ones, or keep them secluded from the rest of the herd.

The following conformation usually indicates a weakness of constitution and a susceptibility to tuberculosis: Head narrow between the horns, sunken eyes, depth of cavity (temporal) back of the eyes, thin narrow ewe neck, chest small, lacking in both breadth and depth, hollow flank and tendency to pot belly, a general lack of muscle so that the limbs seem loosely attached to the body; in breeds that show a variety of colors, animals of the lighter shades of brown and yellow. If, however, such animals are of high value for the dairy, and can be kept free from infection, they need not be rejected. The finest conformations of Shorthorns, Devons, Holsteins, back or red polled, furnish no protection in the presence of the germ.

Don't purchase from a herd in which tuberculosis has appeared, or in which cattle have died or been killed within a year or two. Resort first to the tuberculin test.

Don't take a cow with a husky or rattling cough, wheezing, hurried breathing, discharge from the nose, foetid breath, hard bunches under the skin, diseased udder, swollen bones or joints, unthriftiness, or a tendency to scour or bloat.

Don't purchase from city, suburban or swill stables.

Don't add newly purchased cattle to your herd until you have tested them with tuberculin, especially if they have been the product of in-breeding.

Don't admit strange cattle to house, field or yard with your own. Keep them apart until tested with tuberculin.

In case of disease or unthriftiness in your herd, put your animals apart and have it examined by a skillful veterinarian.

If after this there remains any doubt as to the real nature of the disease, have the animal tested with the tuberculin, in the hands of a practitioner thoroughly acquainted with cattle and their diseases. If the result is not yet quite clear keep the animal by itself and repeat the test in four weeks.

In case one animal in a herd shows tuberculosis, test the whole herd with tuberculin.

Test in the same manner all animals on the farm (swine, goats, sheep, horses, rabbits, cats, dogs, fowls) that dwell with the cattle.

Kill all tuberculous animals and boil, burn, dissolve in acid, or bury deeply in a place to which no animals have access.

Disinfect premises thoroughly, also products of the diseased animals and all articles used by them.

Let no consumptive person attend on cattle on other live stock, nor prepare their food.

Vermin (rats, mice, sparrows) in a building where tuberculous animals have been, should be exterminated."—*Dr. James Law, Cornell University*.

24. "Primary infection through the air is more frequent than any other mode of infection; early stages may consist of glandular affections only; extent and rapidity of the disease depends, at least in part, upon the number of tubercle bacilli inhaled, either within short or long periods of time; tuberculosis of the lungs is not necessarily associated with any other recognizable lung disease as a preexisting favoring condition.

"Tuberculosis of the liver is probably in most cases a result of food infection. Tuberculosis of the serous membrane seems to cause the least damage to the animals affected, taking place principally by escape of bacilli from some forms of the disease situated under one of the serous coverings, as lungs, liver, intestines and associated lymph glands. It does not appear probable that organs are invaded to any extent by tuberculosis starting on their serous covering. The tubercle bacilli appear to be usually carried in lymph channels with the current, but a case of evident retrograde movement of the bacilli has been noticed.

"The virus of the bacilli does not vegetate in the blood, its presence there being accidental. In the more advanced stages of the disease infection of the blood may occur repeatedly. Generalized infection may be recognized by the discovery of foci of disease in organs not assessible to the virus in any other way than through the circulation, or in the lymph glands of such organs. Tuberculosis of the subcutaneous lymph glands and of those situated in the muscular tissue of the trunk and limbs is universally accepted as indicative of the generalized disease. Such glands may be infected from without, but infection through wounds of the skin is quite rare."—*Dr. Theobald Smith, United States Department of Agriculture.*

25. "The tuberculin prepared by the U. S. Department of Agriculture, under the direction of the Bureau of Animal Industry, comes in a much diluted condition and is ready for immediate use. For an injecting instrument, a veterinarian's hypodermic syringe will suffice, but it and the needless employed should be carefully disinfected by soaking in a strong carbolic solution (5 per cent.) for at least several hours. The point of injection may be varied somewhat. We have usually chosen a spot immediately in advance of the shoulder as here the skin is thinner than immediately over the shoulder. After the hair has been clipped off at the point selected, the spot is well saturated and rubbed with a five per cent. carbolic solution (creolin is often recommended), and the inoculation made with the sterile syringe. A light pressure on the spot after injection distributes the fluid. The needle is immersed in a disinfectant after each using. We have never experienced any local swelling at the point of inoculation when such a method of procedure was carried out.

The best time for making inoculations is either in the early morning or late afternoon. For convenience the early morning is perhaps preferable, as the reaction usually begins to indicate itself in six or eight hours, and if a tuberculous reaction is found, it will be manifest by afternoon or evening of the same day. We have made all our own inoculations late in the afternoon, as it was necessary to take readings through at least twenty hours. In actual practice, of course, it is not necessary to take readings of falling temperatures, as the maximum temperatures are sufficient for the purpose.

Tuberculin is not an infallible agent for diagnostic purposes. Like all useful things, its use can be abused so that it needs considerable care and discrimination in employing it. To inject equal quantities of the material into animals regardless of age, weight and general condition, and then say that when the reaction fever exceeds a certain amount in every case that the animal is tuberculous, will give results that are entirely unwarranted. The lymph must be employed with caution, and its results must sometimes be interpreted in the light of other conditions. The objections to its use for diagnostic purposes are without question, often due to the fact that external conditions are not sufficiently considered."—*Dr. H. L. Russell, Wisconsin Experiment Station.*

ANTHRAX.

Custom has authorized the grouping together of several diseases closely connected in their cause, but differing in their external development, under the general name of anthrax. This has caused no little confusion among stock owners, who, becoming partially familiar with the disease in one of its three leading forms, fail to recognize it when presented in all three forms in one outbreak, as was the case during the past season, when all of the leading forms were found in each of two outbreaks investigated by the State officers.

Among the numerous names by which this disease is known, the following may be mentioned: Quarter Evil, Black Quarter, Speed, The Irons, Quarter Felon, Inflammatory Fever, Contagious Carbuncle, Malignant Sore Throat, and Apoplexy of the Spleen. In France, it is justly dreaded under the name of Charbon; in South America, it is equally dreaded under the name of Horse Sickness; in India, it is known under the general term of "Murrain;" in one form it was recognized as Spleenic Fever, Texan Fever and "Trembles," and before veterinary science had been advanced to its present conditions, it was known under the general term of "Murrain;" in one form it was recognized as "Bloody Murrain," and in another as "Dry Murrain," the name following the special form taken by the disease.

In the present advanced condition of veterinary science, the skilled practitioner will have little difficulty in placing the outbreak under one or the other of the three groups known as the Quarter Evil, Glossanthrax, and Spleenic apoplexy, all of which, though due practically to the same cause, vary with the organs suffering most from the attack and the portions of the body externally affected.

For the form known as spleenic apoplexy, Fleming gives the following as the symptoms: "There is a cessation of rumination, and a loss of appetite; weakness or prostration ensues, with stupor or great excitement; shivering and general or partial sweatings appear; or the skin which is harsh and dry; is hot and cold, alternately; tremblings manifest themselves; along the spine and ribs, pressure causes pain; the muscles in some regions, epecially that of the neck, contract spasmodically, and these contractions are often accompanied by plaintive lowing. The contractions become more marked as prostration increases; if the animal is made to move, it staggers and stumbles and progression is nearly impossible; it often falls and has great difficulty in getting up. About this period, a feotid and sanguinolent diarrhoea sets in, accompanied by abdominal pain, which the animal indicates by frequently looking at its flanks. The expression is that of stupor, and the dull, dead appearance of the eye is very characteristic; at the same time the heart beats are loud and tumultuous and the pulse is small and irregular; the temperature of the body may be high, but the legs and face are cold; the respiration, at first sighing and plaintive, becomes panting; the muzzle is dry and the mouth cold and filled with foamy saliva; the tongue is pendant and violet-colored, the buccal membrane yellow, and the animal grinds its teeth; the conjunctival membrane is of a black or reddish-violet hue; the eyes appear to protrude more than usual beyond the orbids and the pupils are dilated. The abdomen becomes distended, the animal falls, blood flows from the nostrils and the foam from the mouth is blood colored, and convulsions, especially of the limbs, commence, and in some animals are so severe that it is dangerous to go near them."

That form of the disease known as "Quarter Evil," is thus described by Dr. Hill: "So rapidly does the disease run its course, that frequently no indications of illness are observed, and much consternation is displayed at finding what appeared a healthy animal the night before, a dead one the following morning. Stiffness and swelling are symptoms generally first noticed, affecting the fore or hind-quarters (hence, the term, quarter evil); this swelling, which is at first hard and tender, becomes soft and puffy; and if the fingers are pressed over it, a crackling noise is produced, due to the presence of gas in the areolar tissue, given off from the stagnant and decomposed blood. The pulse is rapid, weak and nearly imperceptible; the eyes red, visible mucous membranes injected, with ecchymosis spots thereon; respiration laboured and painful, continual moaning and the extremities cold. The symptoms rapidly increase in intensity, and mortification sets in and death closes the scene.

When the skin is removed, the vessels, chiefly at the affected parts, are observed to be distended with blood, which is black and putrid, some of which has escaped through the walls of the vessels into the loose areolar tissue, and emits a most offensive smell. The mucous and serous membranes generally are found more or less congested with extravasations of blood on them."

Fleming thus describes the symptoms in the form of the disease known as "gloss-anthrax."

"Gloss-anthrax is characterized by an eruption of vessels at the base and sides of the tongue, as well as on the gums, palate inner aspect of the lips and even on the cheeks, their appearance being seldom accompanied by fever. The vesicles are at first white and translucid, but they soon change to a grey, yellow, violet and finally, blackish color, and they may either be situated directly on the mucous membrane, or on the summit of a small, sub-mucous tumor.

They increase in size, especially when few in number, and may become as large as hen's eggs; the tongue swells and becomes pendant or protrudes only beyond the incisors, which compress and mark it; at the same time it assumes a bluish or black hue. The vesicles rupture and discharge an acrid, corrosive fluid, leaving ragged ulcers, red in the centre and black around their margin; or they are covered by an eschar beneath, which ulceration goes rapidly on to the destruction of other parts involved. When the vesicles rupture, the phenomena of anthrax fever appear; the parts adjoining the ulcers are greatly tumefied; the animal manifests indications of intense pain; a thick, stringy mucus, mixed with blood and ichorous, gangrenous sanies of the most acrid description, flows in abundance from the mouth; the tumefication attacks the lips and cheeks most severely and reaches the base of the tongue, pharynx, larynx and soft palate and the creature may die of asphyxia, if not of the disease itself, in a few hours, usually from twenty-four to forty-eight, after the appearance of the vesicles."

The prime cause of the disease is the presence in the blood and other circulating fluids of the *Bacillus anthracis*, which, under a combination of favorable circumstances, multiplies rapidly, and it is no doubt that the three forms known to the veterinarian and simply the manifestations of these germs attacking particular organs. Fleming, in referring to this point, writes thus: "The manifestations of anthrax observed in the living animal vary according as the disease runs its course as a general, localized, or non-localized blood disease. In the first, death is usually rapid; while in the others, besides the symptoms due to alterations of the blood, there are also those occasioned by a disturbance of the circulation and local nutrition."

During the past season the officers of the Board were called upon to investigate numerous outbreaks, which, owing to the peculiar character of the weather and water supply during August and early September, were not unlooked for; in fact they were anticipated as an inevitable result of the surroundings of many herds in the State. Of the number investigated, two are worthy of special mention, not only because of the large number of animals involved and the area covered by the infection, but, also, from the fact that in both cases all three forms of the disease were manifested in the same herd.

An outbreak near Tyrone involved 150 animals, and a tract of 1600 acres, while another, near Beech Creek, involved a greater number of animals and an indefinite area, because, practically the range was not limited by fences. In both cases the local residents insisted that the animals had been poisoned, and pointed to the variation in symptoms as a proof of the correctness of their theory.

The extent of this outbreak may be estimated by the following list of animals lost from the Sinking Valley alone; the first column showing the number taken out of the pasture; the second the number missing, and the third the number taken home.

	Taken.	Missing.	Living.		Taken.	Missing.	Living
Robert Miller,	5	4	1	Jane Wertz,	2	1	1
Reuben Fox,	7	3	4	Mr. Rumberger,	8	5	3
Thomas L. Coleman,	18	11	7	J. H. Lotz,	3	1	2
James Louden,	4	3	1	George Kyper,	3	2	2
O. G. Fleck,	8	6	2	Mrs. Ann Bridenbaugh,	6	5	1
James McQuade,	7	6	1	C. Hayden Fleck,	4	3	1
Russell Crawford,	3	3	0	Blair Templeton,	4	1	3
Lt. F. Fleck,	8	6	2	W. W. Stryker,	2	1	1
A. Lee Fleck,	6	2	4	Morrow Tussey,	4	3	1
E. T. M. Fleck,	2	0	2	William McCormick,	2	1	1
Abram Fleck,	4	2	2				
Fleck Bros.,	10	8	2		124	81	43
John A. Fleck,	4	4	0				

The Tyrone outbreak was investigated by Dr. Bridge, G. G. Hutchison, member of the Board from Huntingdon county and the Secretary; that near Beech Creek was examined by Dr. Leonard Pearson and J. A. Herr, member of the Board from Clinton county, and inasmuch as the reports in both cases were as nearly similar as possible, extracts from the report of Dr. Bridge will answer for both herds:

"The diseased cattle were in an enclosure of about 1600 acres, which is located on the top of the mountain, about four miles from Tyrone. On getting into the enclosure, we saw a dead steer, but it was too far decomposed to warrant an examination; after going about one-fourth of a mile further, we saw another, which was in an advanced condition of the disease, with large lesions on the shoulders and which indicate that form of anthrax known as "Black leg;" next we came to a heifer in a dying condition; her mucous membranes were palid, having the appearance which would have been presented had she been bled to death; the skin along her neck would crepitate, and there was a discharge of blood from the anus and nose; this animal had anthrax, but those who accompanied us insisted that all the cases were the result of poison. We next found a steer, staggering along, dropping a mixture of thin, black blood, and as we passed, it must have voided two or three quarts of this material."

Being certain as to the nature of the disease, I commenced a search for its cause; the whole enclosure was covered with a heavy growth of decomposed and decomposing vegetable material, which of itself, in connection with the warm days and cool nights then prevailing, would have been sufficient cause for the outbreak. What impressed me most strongly as the probable cause of the outbreak, was what the accompanying farmers called the "pond," situated about the centre of the enclosure, which was composed of mud, marl and large amounts of decaying animal and vegetable material, and, which in my judgment, was the prime cause of the outbreak, as it is a well known fact that such places are favorable to the development of this disease; and several of the outbreaks which we have investigated have occurred in pastures which have been inundated, and afterwards become dry."

"With reference t the suppression of the disease: Previous to my arrival they had done probably the best that could be done under the circumstances by having removed the well animals from the enclosure, and taking them to pure and uncontaminated pastures where nature would be given a fair chance to combat the production of the germs, if they had already found entrance into the system of the animals. There were 149 animals in the enclosure; sixty had been removed previous to my arrival; thirty were known to be dead, leaving a balance of fifty-four unaccounted for, which were supposed to be dead in different parts of the enclosure or in various stages of the disease and in hiding. My impression, from what I could hear and see, is that about seventy animals were dead out of the original 149."

In the outbreak near Tyrone, the difficulty was complicated by the fact that some of the dead animals were within a few inches of a small stream which supplies a portion of the town with water, and the carcasses were in a too advanced stage of decomposition to admit of removal; the stream, but small at best, had been practically reduced by dry weather, until nearly all the water passed into the city pipes, and the officers of the Board were appealed to for a remedy for the danger which threatened the town. When the dangerous nature of the disease was fully explained, the water company at once commenced to destroy the carcasses with dry wood and coal oil, and, fortunately before any rain had fallen, soon had the danger well under hand, and that which most immediately threatened the town removed.

Inasmuch as the disease is due to a specific germ, it is but reasonable to suppose than an outbreak, especially such extensive ones as those at Tyrone and Beech Creek, would render the pastures more liable to subsequent manifestations of the disease; the death of each animal undoubtedly furnished a new storehouse for numerous germs which, except in the case of the carcasses burned, would retain their vitality for an indefinite length of time, and that in the future, animals pasturing in the enclosures would be specially liable to the disease. While this is true, yet it is a well known fact that the disease manifests itself in its dangerous and most destructive forms only under a combination of circumstances which seldom occur within several years of each other, and, hence, a second outbreak is by no means certain to follow.

That the danger does exist has been abundantly proven, and there were some among the stock owners interested in the Tyrone outbreak who were ready to connect their case with a mysterious and not thoroughly understood disease which prevailed near the same locality three years ago, and upon farms from which some of the animals affected this year originally came.

From what has already been stated in relation to the character of anthrax, it is evident that the main line to safety depends rather upon prevention than upon cure, and in this direction the following items are worthy of consideration and practice:

1. Remove the healthy animals or those apparently so, to other pasture, giving the preference to dry and high fields, where the herbage is not of too rank a growth.

2. Inasmuch as it is clearly proven that anthrax is most likely to break out during the latter part of August or early in September, when the nights become cool and the days are still warm, it is safest, especially in pastures on which there have been outbreaks, to remove all animals and keep them off until a few frosts have made the pasture safe.

3. Grounds upon which outbreaks of anthrax have occurred may be used for early spring and summer, or late fall pastures, but are unsafe during August and early September.

4. If an outbreak is indicated, remove the animals to a clean yard or enclosure, with very scanty pasture, and keep them there without food for four or five hours each day; the object being to avoid plethora which is, in all cases, conducive to anthrax.

5. Shelter the stock at night, and as much as possible from the hot sun during the day; in fact, treat them so as to avoid all sudden or extreme changes of temperature, as such variations are known to be favorable to the propagation of all miasmatic or malarial diseases.

6. See that they have plenty of pure water; it being cold is not os essential as its entire freedom from decaying vegetable or animal matter; these and numerous other outbreaks to which the attention of the officers of the Board has been called, have been clearly due to the use of impure, contaminated water. The fact that they have access to pure, running water is not sufficient, but they should be prevented from having access to impure water, for there is in many animals a perverse appetite, which will lead them to drink impure water even when pure is convenient.

7. In working stock, carefully avoid overwork and exhaustion, as this, at the time of the year noted above, adds greatly to the danger to which all classes of live stock are liable.

8. All dead animals should be buried deeply and covered with fresh or air-slacked lime, as an extra precaution, and, as far as possible, all dogs should be kept away, as the experience of stock owners in Europe, where outbreaks are more frequent and disastrous than here, is that any animal, or even birds, may convey the disease germs to other localities, and thus produce new centres of infection.

9. Animals which have been or are exposed to infection should be given a small amount of sulphuric or carbolic acid, in water, once each day; cathartics should in no case be used; in several cases which have been brought to the notice of our officers, the mortality has undoubtedly been greatly increased by the improper use of strong cathartics, in large doses.

10. Dr. Hill strongly recommends the use of the following mixtures:

Magnes Sulp, ...	8 to 12 ounces.
Sulphur Sub, ...	2 ounces.
Potass. Nitrate, ...	1 ounce.
Zingib, ...	½ ounce.

If more convenient, Potass. Chlorate, in the same amount, may be substituted for the Nitrate.

11. Dr. Williams places great confidence in the use of chlorate of potash which he gives in three drachm doses for full grown animals; this to be given as a preventative and partial cure.

12. Avoid the use of any product of animals from a diseased herd, as food; the disease is rapidly communicable to man through any of the products of the body, and, in olden times, and even yet where the disease is not understood, thousands have lost their lives in this way. Dr. Law mentions a case in which "fifteen thousand of the inhabitants of St. Domingo once perished in six weeks from this cause," and he further states that "The Tartars perish in great numbers from eating their anthrax horses."

12. In handling the diseased or dead animals, be careful to use lunar caustic liberally upon all sores and breaks in the skin, and wash with disinfectants after all post-mortems, which, as they are very dangerous, should be avoided as much as possible.

MILK STANDARDS AND MILK INSPECTION.*

MILK INSPECTION AND MILK STANDARDS.

BY HENRY LEFFMANN, M. D., *Microscopist and Food Inspector of the Board, Philadelphia, Pa.*

No topic in sanitary science has received greater and more careful attention in the past twenty years than the analysis of water and milk, and few topics have exhibited greater transformations as to the principles on which judgments as to sanitary value may be based. The extension of bacteriology has enabled us to identify the causes of disease and to demonstrate in many cases, the methods of propagation.

In water analysis we can still rely with much confidence on the merely analytical results, though we recognize that the figures for chlorin, ammonia, and so on, are merely indexes of pollution and not injurious in themselves. In milk analysis, we have first been obliged to correct our analytical methods, and lately, to revise materially our views as to the manner in which milk affects the public health.

In the judgment of the results of a water analysis, chemists have never been misled into attaching undue importance to the proportion of dissolved matters, but in judging of the results of milk analysis, this error has long been made, and is still being made by sanitary officers. Thus, in the early days of the agitation of the question of milk inspection in Pennsylvania, reference was not infrequently made to the high rate of infant mortality, and this was ascribed to the reduction of the strength of the milk-food by dilution and skimming.

(* NOTE:—At the annual meeting of the Board, one session was devoted to the discussion of questions relating to "Milk Standards and Milk Inspection." These subjects were selected because at the preceding session of the Legislature, the Senate Committee on Agriculture had requested the Secretary of the Board to thus introduce the question at one of the meetings of the Board, and obtain the opinions, pro and con, of those interested.

All parties interested were invited by advertisement and printed programmes, and a number of persons, known to hold diverse views, were invited to be present and explain their positions. The following papers are presented as exponents of the opinions of those whose names they bear, upon the two leading questions presented, and they are offered in a consolidated form at the suggestion of the Senate Committee on Agriculture—*Secretary.*)

At the present day we are in possession of a much wider and more exact knowledge as to the manner of the distribution of disease by milk. We now know that the serious dangers arise from the contamination of the milk by microbes, and that such dangers fall practically into two classes.

The first class is that due to contamination of milk by specific micro-organisms from disease, either among the milk-yielding animals or among the persons about the farm. I do not think that it will be necessary to discuss these questions in much detail, for all are pretty familiar with the subject. Possibly, some may not fully appreciate the extent to which specific disease in dairy cows exists, and to which it infects human beings, but I frankly say that I am a convert to the view that the production of cows' milk for human food, under the present methods of collection and use, is one of the most dangerous of human industries. As an illustration of the extent to which tuberculosis may exist in herds, I take the following articles from the "Medical Record" of Jan. 6, 1894.

"Probably few physicians are aware of the enormous practical value in the animal industry of tuberculin, that is to say, if the position taken by the New York and other State Boards of Health regarding it, is correct. A gentleman who has a valuable herd of thoroughbred cows writes us that twice within the last six months, his herd has been examined by competent veterinarians and pronounced healthy. A third examination, however, with the aid of tuberculin, caused a condemnation of over one-half of the herd." He adds:

"The New York State Board of Health is killing by the hundred, animals condemned by diagnosis with tuberculin, and the State is paying full value for them. The veterinarian says that the autopsy shows the diagnosis to be correct in every case." He says, also, that it is impossible for the best veterinarian to discover tuberculosis by physical examination except in extreme cases. "My herd is apparently in splendid condition. Breeders do not know of its existence in their herds. They let a cow remain in the herd until she is unquestionably tuberculous and then remove her, but she has then already infected the herd. A temperature of 103 degrees F. condemns the cow." In a herd of Jerseys, at Troy, of 80 head, he has killed 33, and will kill 20 more of them this week. Autopsies are held in the presence of physicians and veterinarians. There have been 15,000 tests with tuberculin in England. New York evidently believes in this kind of diagnosis, and will probably have to pay $500,000 to eradicate tuberculosis. The veterinarian says the State is full of it, in herds of thoroughbreds and common cows.

"We understand from other sources that the State Board of Health fully believes in the certainty of the tuberculin diagnosis. Through its means it has been discovered that some of the best bred herds, supplying high-priced milk, cream, and butter are infected."

It is apparent from this article, which is merely one of many similar statements, that we have not fully realized the relations of milk to the prevalence of the disease which is known to be the cause of one-seventh of the total deaths in civilized countries, and is the unsuspected cause of many more.

It is, however, not only disease in the cow which may be conveyed. The conditions of farm life are such, that milk often conveys virulent infectious diseases from the dairyman's family to his customers. Here again the literature is so abundant and the facts are so generally known, that I need not stop to detail them. Those who are interested in this phase of the question will find some valuable and recent data in the report of the State Board of Health, of Massachusetts. Several epidemics of typhoid fever were traced to milk supplied from a farm on which a case of this disease existed.

We find, however, that even when milk is taken from cattle entirely healthy, and on farms in which no specific disease exists, it may become a most dangerous article of food. This is due to the decompositions which are induced in it by bacteria. Milk is a close approach to a perfect food. It is not an absolutely perfect food for human beings, because it is deficient in iron, but it serves admirably as a medium for the growth of bacteria, many species of which produce remarkable changes in the casein by which highly poisonous compounds are set free. Now, under the ordinary methods of milking, infection with multitudes of the common air, water and even soil bacteria, is certain to occur. That milk usually contains these is proved by the deposits obtained in centrifugal skimming which show under microscopic examination, many repulsive materials. When milk as ordinarily furnished is kept at summer temperature, the bacteria increase with great rapidity, and it is now recognized that a proportion of the infant mortality in the warmer season is caused by this condition. In fact, the information at present in our possession shows that unless collected under extreme precaution, raw milk, at least cow's milk, is not a suitable food for human beings. Hence the general practice of sterilization which has resulted so favorably in the feeding of infants. Statistics have been recently published which show that death from tuberculosis occur in large proportion in infants, the action being due to the entrance of the tubercle bacillus into the lacteals, thus preventing the absorption of the food and causing death by starvation.

I have endeavored so far to indicate briefly, but I hope distinctly, the idea that sanitary control of milk supply may have little to do with the mere question of the chemical composition of milk. It is of very little moment to the consumer, except on a question of cost, whether milk contains 12, 13 or 14 per cent. of solids. The claim that milk watered or skimmed is unwholesome, rests on no positive information, and within certain limits of variation, the regulation of the composition of milk is no more a matter of sanitary duty than the regulation of the proportion of fat and lean in the meat sold in our markets, or the proportion of alchohol and extract in beer and ale. Nevertheless, economic considerations will doubtless lead to the establishment of some standard for milk, and it will be sufficient to fix the minimum not the average. The time is past when we can claim 9.50 solids not fat for a standard, and even 9.00 per cent. is unjust. In my opinion, there should not be fixed in any legal enactment, a higher figure than 8.50 per cent. of solids not fat, and 3.00 per cent. fat for whole milk. Skimmed milk should be permitted to be sold as such and should not be required to contain any fat, that is, any one purchasing skimmed milk should assume that all the fat may have been removed. I have never been able to understand the logical process in the minds of those who desired to prohibit the sale of skimmed milk.

However, when we remember that the same parties who last winter were trying to prevent the sale of skimmed milk proposed also to prohibit the sale of condensed milk, containing less than twenty-five per cent. of fat, which would exclude all the standard brands in the market, we can appreciate the impracticable views that may be advanced.

It has been the custom of some persons to designate the skimmed milk from centrifugals as "separator slop," but I am unable to see that such an article is any more of the nature of a refuse than butter-milk, whey or cheese.

The standard of the Society of Public Analysis of England, an organization which represents, I think, the highest judgment and experience on the question, is 8.50 solids not fat and 3.00 of fat. Concerning this standard, Dr. Vieth, a dairy chemist of large experience, recently expressed himself as follows:

"My object is by no means to raise the cry that the standard adopted by the society is too high; on the contrary, I think it is very judiciously fixed, but in upholding the standard of purity, it should not be forgotten that the cows have never been asked for, nor given their assent to it, and that they will at times produce milk below standard. A bad season for hay-making is, in my experience, almost invariably followed by a particularly low depression in the quality of milk, toward the end of winter. Should the winter be of unusual severity and length, the depression will be still more marked. Long spells of cold and wet, as well as of heat and drought, during the time when cows are kept on pasture, also unfavorably influence the quality, and, I may add, quantity of milk."

Much discussion has been given to the effects of special forms of food and their relation to the wholesomeness of milk. Legislation promoted by health boards often involve prohibition of the use of brewers' grains or distilling refuse. In regard to these matters I desire to transcribe two personal letters received from Dr. Vieth, whom I have just quoted.

"The reason that I have not acknowledged and answered your favour of August 21st, ere this, is, that I desired to give you as much information as possible on the subject of the effect of brewers' grains and similar refuse on the wholesomeness of milk.

I suppose it is about the same in your country as it is in ours, viz: that people are not slow in passing an opinion on the matter in question either one way or the other; but when one sets to work, to follow the matter up, one finds these opinions not substantiated by facts. I was, when I received your letter, not aware of any publication on the matter in question, and have since taken much trouble to find one or collect information worthy to be transmitted to you. I am sorry to say, that I have failed in my endeavors almost entirely. Hunting through the literature, I have found brewers' grains barely mentioned in connection with the question of the wholesomeness of milk—and have got the impression that no one thinks of expecting any bad effect from the use of that food. Here the question turns almost entirely about the admissibility of distillery-wash as food for milk-cows. This food has a good many adversaries, but, it seems, even more defenders. It is generally admitted, that, when fed in moderate quantities and in a fresh state, and other food given besides, it will do no harm. When given in large quantities—say fifteen to twenty gallons per day—it certainly produces a very poor milk, which is said to have a bad effect on infants. This is most likely true, but I have failed to find it proved by experiments or exact observations. The best observations on the subject, I have come across, are made by Prof. Konig, and are contained in a paper which has been published in "Repertorium fur Analytische Chemic, 1881." They are also based on theoretical speculation, and not on actual experiments. ·Before leaving the subject, I should like to mention, that there is most likely a considerable difference between brewers' grains from ale and from lager beer breweries.

"When your card of the 21st ult. arrived, I had just come into possession of some more evidence with regard to feeding milch-cows with distillery wash, that is, the refuse from the manufacture of potato-spirit. Professor Konig of Munster, and Maercker of Halle, are two eminent authorities on the subject of cattle-feeding. The former is of opinion, that there is no objection to give to cows forty to fifty liters of fresh distillery wash per diem, provided other suitable food is given in addition. He would rather not have the distillery-wash used in a sour condition, and objects to feeding children with milk from cows which have received it. In the prohibition of the use of distillery-wash, he would see a serious injury; but it should be demanded by law, that milk thus produced should all be sold in the sterilized condition. All the objections would be overcome by the use of distillery-wash in the dried state.

Prof. Maercker writes, that the supposition that the milk from distillery-wash fed cows is injurious to health, is in no way supported. The distillery-wash is completely sterilized in its manufacture, which is not the case with any other food. If milk from distillery-wash fed cows has caused illness, the fault is that proper care had not been taken to keep the cowsheds, and more particularly, the mangers, clean. Under such conditions, any food might produce similar ill effects.

Ohlsen and Ufflemann, of Rostock, have made an investigation into the matter and published the results in the "Jahrbuch fur Kinderheilkunde, 34, Volume 1." The results are in short, as follows:

"The milk from cows fed with distillery-wash is of neutral, sometimes alkaline reaction. Acidity did not set in before the lapse of forty-eight hours. Provided suitable food be given in addition, the milk does not appear unsuitable for feeding infants. There is no proof that the milk produces indigestion or rachitis with infants. Microscopic and bacteriological examination did not prove any difference from other milk.

The work of Ohlson and Ufflemann is the first evidence on the subject, founded on exact observation, which has come to my knowledge, and as I thought it might be useful to you, I wished to draw your attention to it without delay."

It appears, then, that the danger from milk, as far as the dairyman is concerned, is the introduction of specific germs through diseased cattle, and it is worthy of note, that the liability to such disease is as great, if not greater, in cattle yielding rich milk, than in those yielding poor milk. One of these reasons that sanitary officers have sometimes given for asking that the legal limits of milk shall be fixed above the average, is that it will tend to "improve the quality of the dairy cattle" supplying the city. Independently of the fact that it is no part of a sanitary method to develop superior types, it seems that such stimulation will lead to the worst conditions. Questions of chemical composition are trifling in proportion to the matter of the prevention of the spread of specific disease.

MILK INSPECTION AND MILK STANDARDS.

BY PROF. C. B. COCHRAN, *Microscopist of the Board, West Chester, Pa.*

This subject of milk legislation is one that is very important to the agriculturists of our State. I think the members of the State Board of Agriculture need to exercise great care that they do nothing by which the public confidence will be diminished in our milk supply, and thereby interfere in any way with our milk market. On the other hand, it is desirable that such steps shall be taken so as to increase the confidence in our milk supply, and thus increase the demand for it.

Perhaps, if I can testify to any part of this subject, it is in regard to the milk of different breeds of cows as it comes from them in the condition of purity. I have had ample opportunity for the past ten years of examining milk of animals of known purity. I have taken occasion during all that time of very frequently visiting dairies of Jersey, Durham, Guernsey and Short-Horns, and obtaining the milk directly from the cows at the time of its being milked, so that I could testify to its purity. Having carried on that work for a long period of time, I feel I can say something in regard to limits, not speaking of abnormal milks, but milks as they come from animals that are well bred and well kept in every particular.

I have found the total solid limit ranging as low as 11.3 and running that for a long time. I have found the fat below three per cent. and solids and fat as low as eight and a half per cent., and continuing for sometime. I have found that milk varies in composition.

Another condition affecting it is the time of milking. During the summer time when the period between morning and evening milking is long, we are likely to find the morning milk rich in fat, while the evening milk is poorer. In winter, it is likely to be reversed, the morning poor and the evening milk rich.

So far as standards are concerned, I was very much pleased to hear from both Dr. Leffmann and Dr. Lee, as to the warrant of fixing the standards as low as eight and a half and eleven and a half for total solids, but as yet I do not feel that we are prepared at this time to adopt any such standards for milk at all. Where a low standard is adopted, it has worked very great disadvantage. The producer or dealer oftentimes water or skim down to the standard. Such has proven to be the case in New York State. What we want to put upon the market, as far as possible, is a pure milk, that will stimulate men to increase the quality of milk rather than milk that shall meet the requirements of a low standard. If a high standard be adopted, innocent men may be convicted. I admit that a few per cent. added water is not so material in matter as regards its nutritious condition. For instance, if we take milk and add about ten per cent. of water, we still have nine-tenths milk, and it only requires, that one-tenth more of this milk be taken by the child to obtain the same nourishment.

Furthermore, I want to call your attention to the statement made by Dr. Lee in regard to what we want milk to contain: We want the bone producing elements; we want the nutritious elements; the muscle producing elements. I want you to notice the argument he has put forth here in regard to skim milk. I want you to notice that skim milk is milk, minus fat; suppose you remove all the fat, you still have the other nutritious constituents of milk.

With regard to the watering of milk in our cities as compared with the watering of milk at other points, in small towns, Dr. Lee has given us a very striking instance. I do not doubt that many such cases have occurred. We do know, however, and I recognize the fact that I am speaking to a body of farmers, that it is not where a man lives that makes him honest; not merely because he lives on the farm, or stands behind the counter; and, consequently, we find milk watered everywhere. We find it watered by the farmer as well as by the milk dealer and grocer. I have had for the last three or four years, about two hundred dairies that I am examining weekly, and I occasionally find (I am glad to say, not very frequently) cases of very serious watering—watering to the extent of forty per cent. practiced by farmers, a watering which nothing but ignorance could permit.

With regard to the use of annatto, the statement was used here that the annatto was moistened by stale urine. I know that statement has been made and received considerable credence. I have somewhere seen this statement denied. However, even if this be true, the annatto put in solution, can hardly contain the bacteria or germs that may have arisen from the decomposition of urine, or got into it in that way. Usually it is in solution in caustic alkali or alcohol, which would kill those bacteria. I cannot say that I individually regard annatto as innocent in its effect, used as it often is, to cover up fraud, to give an appearance which an article ought not to possess. It, of course, is not innocent. I have taken at times quite large quantities of annatto, eaten it, or taken it in quantities to color forty or fifty pounds of butter, simply to satisfy my own mind upon this particular subject; and I have never experienced the slightest ill effect from it, although I would take in a single dose, enough to color forty or fifty pounds of butter.

DISEASES CAUSED BY UNWHOLESOME MILK.

BY DR. GEORGE G. GROFF, *Sanitarian of the Board, Lewisburg, Pa.*

Milk is the only animal food which is taken into the system uncooked. It is a complete food, in that it has in it all the elements needed for the nourishment of the body. Its powers to absorb bad odors is well known. It is readily perishable food, in that it will not remain wholesome for any great length of time. It is a food which is by most persons easily digested. It is the almost exclusive food of all human beings during the first year of life. Children who are fed artificially on cows' milk suffer to a far greater extent from cholera infantum, debility, inanition, marasmus, inflammation of the bowels and teething, than do children fed naturally on their mothers' milk. Thirty-six and twenty-nine one hundredth per cent. of the deaths in Philadelphia in 1891, were of children under five years of age. Of these deaths, 61.02 per cent. may fairly be attributed to disorders of digestion. The same percentages will doubtless hold in other cities and towns. A recent English health report states that the editor of the "British Medical Journal" had ten years ago shown that seventy-one epidemics had been traced to milk. Fifty were of typhoid fever, fifteen of scarlet fever and six of diptheria.

From the knowledge which we now possess, we feel safe in saying that no milk should be used for human food from any cow suffering from tuberculosis (consumption), from pleuro-pneumonia and contagious-pleuro-pneumonia, from bloody murrain (bacillar anthrax), milk fever, cancer, lump jaw, foot and mouth disease, any wasting disease, or trembles. In a word, the milk should not be used for human food from any sick cow.

For some days after calving, as well as before that time, milk is not wholesome. At some creameries, the milk is rejected for sixty days before, and twelve days after calving. Ropy and bloody milk should never be used for food. Dirty milk (from stable filth), stale milk, and milk adulterated with chemicals may all produce diarrhoeal troubles, which, in infants, may prove very serious or even fatal.

Consumption is the scourge of the human race, killing about one-seventh of all who die each year. It also affects all of our domestic animals, being rarest in the goat and most frequent in cattle. Consumption does not occur among wild animals until they are confined. It is one of the most fatal diseases in zoological gardens. It is said not to prevail in polar regions, as in the extreme north of Norway and Sweden, and Russia, nor in portions of Africa and South America. It is a disease of civilized life, and is spreading throughout the world. Among cattle in the United States, it is most prevalent in the vicinity of large cities, and in herds of imported cattle, the native breeds being comparatively free from the disease. In Italy, it is said to be, "a veritable plague for agriculture." Different authorities give the number of cattle suffering from the disease in Europe at from two to seven per cent. of the whole number. In the neighborhood of Philadelphia, in 1892, Dr. Leonard Pearson, of the University of Pennsylvania, in 500 head examined, found twenty per cent. affected with tuberculosis. Dr. Favill, in Baltimore, in 1597 cattle examined, found three per cent. affected with the disease. Dr. W. D. Blaine, in 4,000 head examined in New York, found twenty-one per cent. tuberculous. In 1893, 20,000 cows were examined in New York under authority of the Board of Agriculture, and 686 were found with tuberculosis and killed. This is nearly three and a half per cent. In some herds, all the cows have been found to be affected; in others, from ten to twenty, thirty and even fifty per cent.

Tuberculosis is a contagious disease among human beings. It is contagious among cows. The closer and warmer the stables, the more the disease is likely to spread in a herd.

The cause of the disease is now established to be a minute, living organism. This organism is sometimes found in the milk of turberculous cows, especially when the disease is seated in the udder. Milk from diseased cows will often reproduce the disease in guinea pigs, even where no bacilli can be discovered with the microscope. This has been found true in from ten to twenty-five per cent. of cows examined by different experimentors. In 1893, Prof. Stoeler, of Schenectady, N. Y., found the milk of a cow crowded with the bacilli of consumption, and yet her udder and teats were apparently free from the disease.

There are so many different ways in which a human being may contract the disease that it is very difficult to lay the cause to milk in any specific case, but it is certainly safe to say that the milk of consumptive cows is best left alone.

According to Prof. Law, of Cornell University, the use of milk from cows suffering with the disease called "foot and mouth disease" is capable of producing in the person using it, dangerous intestinal disturbance. Fortunately, the disease is not common in the United States.

Trembles is a disease not uncommon in the autumn of the year, among cows in the newer portions of the South and West. The animal is affected with an obstinate constipation of the bowels, and wastes away, dying after some weeks or months. It is said that the milk, butter, cheese and flesh from a cow so diseased, is poisonous, producing symptoms similar to those seen in the cow, and which generaly proves fatal. The cause of the disease in the cow is unknown, but is generally attributed to the eating of some poisonous herb. As the country becomes settled and the cows are confined to the farm, the disease disappears. I have not heard of it in Pennsylvania.

The milk of cows suffering from other diseases named above, as well as from all sick cows, the nature of the sickness being unknown, should, on general principles, be avoided. The milk from any sick animal may produce intestinal disturbances, as of an active poison, which might in some cases, prove very difficult to control.

The contamination of milk may, however, take place after it leaves the cow, and of epidemics following such contamination we have more positive knowledge than of the diseases transferred from the cow. It seems well established that the germs which produce typhoid fever, scarlet fever and diptheria, may all live in milk, and in that way be taken into the system.

Many outbreaks of typhoid fever have been traced to contaminated milk. We will mention two: In 1890, there was an outbreak of typhoid fever in Waterbury, Connecticut. Fifty new cases occurred in the month of June. Of these it was discovered that forty-one used milk purchased of one dealer. This dealer purchased daily 160 quarts from a farmer, who at the time, had in his family, three persons suffering with typhoid fever. Though the milk was cooled at the barn, there was evidence that the water in which the pans were washed, and the water in the tank where the milk was cooled, was contaminated. It was considered that this milk was the sole cause of the epidemic.

In September, 1892, an epidemic of typhoid fever began in Nanticoke, Penn'a, the town having been previously free from this disease. In all, forty-nine cases of the disease were reported. The epidemic was investigated by Dr. Lewis H. Taylor, of Wilkes-Barre, Penn'a. The water supply of the town was examined and found to be free from contamination. The disease confined itself to the higher and better portions of the city. In this epidemic, forty-five cases, with seven deaths, can be fairly traced to the use of milk from one farm. At this farm were found eight persons sick, six of them with typhoid fever. It is thought to be clearly established that the epidemic was due to the use of milk from this one farm.

In 1893, an epidemic of typhoid fever in London, was traced to the use of ice cream which had been made from contaminated milk.

Dr. Klein Hart, of London, speaks of seven outbreaks of diptheria due to contaminated milk. In August, 1893, Dr. Hunt, secretary of the New Jersey State Board of Health, reported an epidemic of diptheria in Hightstown, N. J. In eighteen cases out of twenty examined, the disease was traced to the use of milk purchased from one dairy. The owner of this dairy had in his employ a boy who was suffering from this disease.

In his report on "Influence of Milk in Spreading Disease," by Dr. E. O. Shakspeare, of Philadelphia, the following statement occurs: 'It is reported that in the southern district of Glasgow, from August 4th to the 12th (1893), no less than 224 individuals were attacked with scarlet fever, concerning whom the evidence pointed to one particular dairy as the source of the infection. And it was found by inspectors that, although the business of that dairyman was conducted with scrupulous attention to cleanliness, and the cows were well nourished, yet nearly all of them had suffered, and at the date of inspection, were still suffering from an eruption of the udder, which had caused several of the milkmen to contract from the teats, sore hands. A child in the family of the farmer who had the care of the herd which produced the milk, was also suffering an attack of scarlet fever, which had begun about the time of the commencement of the epidemic." Dr. Stickler, of Orange, N. J., who, is, perhaps, one of the most voluminous of American writers on this subject, and who is admittedly a high authority in epidemology, has frequently, within the past few years, reported the results of his extensive observations concerning the causative relations of scarlet fever to milk from cows suffering with the peculiar symptoms, scarcely observable, of an eruptive affection of the udder, and to milk from herds where scarlet fever exists in the family of the dairyman. Dr. Klein Hart, of London, enumerates fifteen epidemics of scarlet fever due to milkers having this disease and contaminating the milk.

Dr. L. H. Miller, thus writes in the "Medical Record: "Late in January last (1889), a daughter of one of our dairymen went to the city for a visit. The next day after arriving there, she was taken sick, manifesting the symptoms of scarlet fever. It was a mystery to her parents as to where or how the disease had been contracted. Two weeks after her recovery, her physician said that it would be safe for her to return home, which she did.

Two weeks later, March 11, her next youngest sister, who slept with her, had her first symptoms of scarlet fever.

The case was reported, the health officer visited the house, quarantined it, and his first and most emphatic injunction was that the dairy business should be conducted entirely away from the house; that nothing should be taken from the house to the dairy.

All went on well until April 4, when a number of cases of the fever started in different parts of the village. One adult and two children in each of two different families were taken at about the same time, so that on the 6th, twelve cases were reported. The health officer at once suspected that the milk had been infected.

A thorough investigation showed that everyone who had the fever had drank the milk, and not one who did not drink it was affected; that at the quarantine, his orders had been scrupulously obeyed; but that the milkman, however, had washed and wiped his cans with white flannel cloths taken from rags left in the barn by the rag peddler.

After delivering milk on the morning of the 7th, this man was not allowed to sell any more; and after the 8th, no new cases of scarlet fever occurred till the 18th and 19th, when two cases started in the same families where it had been introduced by the milk; and no other cases have occurred up to the time of writing (April 25). From April 4th to 8th, twenty-four cases developed directly from drinking the milk. The stage of incubation in every one of these cases seemed to have been less than twenty-four hours, and the first symptoms, in most of the cases, were very severe; intense pain in stomach and bowels, excessive vomiting, and a profuse diarrhoea. After these symptoms, nearly every case has run a mild course, and there has not been a single death.

The facts, altogether, seem to indicate that the dairyman's children, in the first place contracted the fever from the rags, and from the same source the milk became infected."

The "London Lancet," in 1892, reports an outbreak of scarlet fever at Leyton, in Essex, which was mostly confined to the customers of one particular milkman.

During the past ten years, the public has become familiar with numerous cases of wholesome poisoning by cheese, ice cream and milk. Through the investigations of Dr. Victor C. Vaughan, of the University of Michigan, it has been discovered that there exists a poison named by him, "Tyrotoxicon," and which is always present in poisonous cheese, poisonous ice cream and poisonous milk. The conditions under which this poison is produced are not fully known, but whenever milk stands for a long time in a warm atmosphere, it is liable to be produced. Uncleanly conditions of milk vesels, cans, milk house, etc., may also be favorable to the production of tyrotoxicon. The investigations of Dr. Vaughan show that this poison is productive of a great amount of sickness, and even of deaths. We can best illustrate this action by quoting from a report by Newton and Wallace, 1888.

"On August 7, twenty-four persons, at one of the hotels at Long Branch, were taken ill soon after supper. At another hotel on the same evening, nineteen persons were seized with the same form of sickness. From one to four hours elapsed between the meal and the first symptoms. The symptoms noticed were those of gastro-intestinal irritation, similar to poisoning by an irritating material—that is, nausea, vomiting, cramps, and collapse; a few had diarrhoea. Dryness of the throat and burning sensation in the oesophagus were prominent symptoms.

"While the cause of the sickness was being sought for, and one week after the first series of cases, thirty persons at another hotel were taken ill with precisely the same symptoms as noticed in the first outbreak.

"When the news of the outbreak was published, one of us immediately set to work, under the authority of the State Board of Health, to ascertain the cause of the illness. The course of the investigation was about as follows:

"The character of the illness indicated, of course, that some article of food was the cause, and the first part of our task was to single out the one substance that seemed at fault. The cooking utensils were also suspected, because unclean copper vessels have often caused irritant poisoning. Articles of food, such as lobsters, crabs, blue fish, and Spanish mackerel, all of which at times, and with some persons very susceptible to gactric irritation have produced toxic symptoms, were looked for, but it was found that none of these had been eaten at the time of the outbreak. The cooking vessels were examined, and all were found clean and bright, and no evidence of corrosion was presented.

"Further inquiry revealed the fact that all who had been taken ill had used milk in greater or less quantities, and that persons who had not partaken of milk, escaped entirely; corroborative of this, it was ascertained that those who had used milk to the exclusion of all other food, were violently ill. This was prominently noticed in the cases of infants fed from the bottle, when nothing but uncooked milk was used. In one case, an adult drank about a quart of the milk, and was almost immediately seized with violent vomiting, followed by diarrhoea, and this by collapse. Suffice it to say, that we were able to eliminate all other articles of food and to decide that the milk was the sole cause of the outbreak. Having been able to determine this, the next step was to discover why that article in these cases should cause so serious a form of sickness.

"The probable causes which we were able to investigate were outlined as follows: (1) Some chemical substance, such as borax, boric acid, salicylic acid, sodium bicarbonate, sodium sulphate, added to preserve the milk or to correct acidity. (2) The use of polluted water as an adulterant. (3) Some poisonous material accidentally present in the milk. (4) The use of milk from diseased cattle. (5) Improper feeding of the cattle. (6) The improper care of the milk. (7) The development in the milk of some ferment or ptomaine, such as tyrotoxicon.

"At the time of the first outbreak, we were unable, unfortunately, to obtain any of the noxious milk, as that unconsumed had been destroyed; but at the second outbreak, a liberal quantity was secured.

"It was soon ascertained that one dealer had supplied all the milk used at the three hotels where the cases of sickness had occurred. His name and address having been obtained, the next step in the investigation was to inspect all the farms, and the cattle thereon, from which the milk was taken. We also learned that two deliveries at the hotels were made daily, one in the morning and one in the evening; that the milk supplied at night was the sole cause of the sickness, and that the milk from but one of the farms was at fault. The cows on this farm were found to be in good health, and, besides being at pasture, were fed well with bran, middlings and corn meal.

"So far, we had been able to eliminate as causes, diseased cattle and improper feeding, and we were then compelled to consider the other possible sources of the toxic material.

"While the inspection of the farms was being made, the analysis of the milk was in progress. The result of this showed that no chemical substance had been added to the milk, that it was of average composition; that no polluted water had been used as a dilutent, and that no poisonous metals were present. This result left us nothing to consider but two probable causes: improper care of the milk, and the presence of a ferment.

"As to the former, we soon learned much. The cows were milked at the unusual and abnormal hours of midnight and noon, and the noon's milking—that which alone was followed by illness—was placed, while hot, in the cans, and then, without any atempt at cooling, carted eight miles during the warmest part of the day, in a very hot month.

"This practice seemed to us sufficient to make the milk unpalatable, if not injurious, for it is well known that when fresh milk is closed up in a tight vessel and then deposited in a warm place, a very disagreeable odor and taste is developed. Old dairymen speak of the animal heat as an entity, the removal of which is necessary in order that the milk shall keep well and have a pleasant taste. While we do not give this thing a name, we are fully convinced that milk should be thoroughly cured by proper chilling and aeration before it is transported any distance, or sold for consumption in towns or cities."

In 1887, Dr. Vaughan investigated a case of poisoning by tyrotoxicon which occurred in the family of a farmer near Ann Arbor, Michigan. Four members of the family were poisoned; three died. The following is a description of the room in which the milk was kept, and where it became contaminated with the germs producing the poison:

"One corner of one of the rooms had been transformed into a small room or 'buttery,' as it was called, and in this, on shelves, the food was kept. On account of the more frequent scouring demanded by that part of the floor enclosed in this 'buttery' the boards had rotted away, and a second layer of boards had been placed over the original floor. Between these two floors we found a great mass of moist, decomposing matter, the accumulations of years, which the broom could not reach. When this floor was taken up, a peculiar, nauseating odor was observable, and was sufficient to produce nausea and vomiting in one of the persons engaged in the examination. Some of the dirt from beneath the floor and some of that which had accumulated beneath the boards of the 'buttery' were taken for further study."

Dr. Vaughan's investigations show that tyrotoxicon is often present in milk, and that it is one of the causes which produce that very common and fatal disease among children, cholera infantum. It is not asserted that tyrotoxicon is the only cause of cholera infantum, but there can be little doubt but that it is often the cause of this disease.

It has been shown that unwholesome milk may cause disease. What can be done to secure a more uniformly wholesome article?

In the first place, dairymen should be instructed by plainly written tracts and otherwise, of the possible contamination of milk by sick animals, by sickness in the family of the dairyman or his assistants, and by putrefactive changes which may take place in milk when not quickly cooled, or when kept in unclean vessels or in an unclean place. They should be shown that all chemicals added to milk for any purpose may prove an injury to the person using the milk.

In the second place, there should be established a system of dairy inspection by which diseased animals could be weeded out of herds, and general directions could be given as to the care of the milk, of cleanliness in the stable, milkhouses, and in reference to the food and water of the cows. There should be a State law regulating dairy inspections, the enforcement of which law should rest in the board of health of each city and borough. It should be made a misdemeanor for any one to sell milk, butter or cheese from any animal sick of any disease named above.

DISEASES CONVEYED BY MILK.

BY DR. BENJAMIN LEE, *Secretary of the State Board of Health, Philadelphia, Pa.*

Before entering upon a discussion of this question which my friend, Secretary Edge, has courteously requested me to take part, I desire to express my appreciation of the honor conferred upon me by being permitted to appear before a Board for which I entertain so sincere a respect. And this not because of the vast interests which it represents and cares for, but because of the well known respectability, solidity and integrity of the class of citizens from whom its membership is drawn.

Of the immense interests involved in agriculture, it is scarcely necessary to speak when we remember that the dairy products alone of the United States, in a single year, reach a value exceeding three hundred millions of dollars, and that the value of the eggs laid in the United States annually reaches over one hundred millions of dollars. We are sometimes inclined, when we see an old hen come cackling off her nest, to ridicule her for making so much fuss about it, but I tell you that that old hen knows her duty and does it, and if each of us knew our duty and did it as well, we should have a different state of things in our country.

I come before you not as an expert, not as an agriculturist, a chemist, or bacteriologist; but first, as a sanitarian, and secondly, as a physician who has been compelled in his practice, to observe something of the injurious effects of infected milk.

The great American eagle is a bird for which we all have great respect. It is certainly a very fine bird; and yet the great American eagle must bow to the universal laws of nature; and we find as our country goes on increasing in population that precisely the same laws 100 to 400 years, are beginning to prevail here. Precisely the same laws of sanitary science which have been existent in Europe for from 100 to 400 years are beginning to obtain here. Precisely the same problems are confronting us, and we must meet these problems as they have been meeting them, and must be willing to accept their teachings. I can remember, and some of you can remember, when there was not such a thing known in this State as a uniformed policeman; now there is scarcely a city in the State without them. Why is this? Because from experience in Europe, it was found that the uniformed police were of greater efficiency than the ununiformed. I can remember when there was not such a thing in an American city as a paid fire department, (and so can you), and now there is no city in the State without one. Why? Because it was the experience of European cities that the paid fire department was more efficient than a volunteer fire department. So you may run through the whole scale of the social problem.

Take, for instance, State Boards of Health; they are recent things in this country; how very recent, our own Board, only having existed for eight years, evidences; and yet, now, at least three-fourths of the States in the Union have their State Boards of Health. Why is this? Because the experience of European countries has been, that there is a necessity for some central administration in the interests of the public health. I do not recollect exactly how long your own Board has been in existence, possibly since 1877. Your Board sprang into existence as a result of the same train of reasoning—the fact that it was found necessary in civilized countries, especially in Europe, to establish some central administration which should protect the agricultural interests. Following the same line of reasoning, I maintained that milk inspection is a necessity in a great civilized country. It has already been adopted in this State; it has been adopted in every progressive State in the Union; it is therefore, perhaps, quite unnecessary to stop to prove the fact.

The fact which Dr. Leffman has brought to your notice, namely: That infectious diseases are constantly distributed through milk, is one which our own Board has had occasion to know a great deal about. During the past year we have traced an epidemic of typhoid fever directly to the milk produced by a certain dairy, near the town of Nanticoke. We are constantly conferred with in cases where it is feared that infection will be conveyed, and I have here a letter which I recently wrote to a dairyman, in whose house scarlet fever existed and who kept his milk in the cellar of his house. It reads as follows:

"Dear Sir: The medical inspector who visited your place yesterday reports that he left the following instructions, which you, for your part, solemnly promised to comply with in every particular. First, that milk already in the cellar should be thrown out, and not sold or otherwise used. Secondly, that the child and her mother should be kept strictly separate from the rest of the family, in the second story. Thirdly, that no one living in the house should take part in the milking. Fourthly, that the milk should be taken to some other place for storage before sale. Fifthly, that the patient should be kept secluded until all danger of the communication of the disease has passed, which would be six weeks from its commencement, or longer if the attending physician found that she was still shedding the dead skin, which is excessively infectious. Sixthly, that, after the physician pronounced that it was entirely safe for her to mingle with others, and her room was vacated, her room should be thoroughly disinfected, in accordance with the instructions of the State Board of Health, and the rest of the house so cleansed as the attending physician may direct.

"I shall be in communication with the physician, and shall request him to see that these instructions are rigidly complied with. I send you circulars of the Board, showing the proper precautions to be taken, and also indicating how milk should be kept and prepared for market, as well as the management of the cows.

"You will observe from this that the State Board of Health very strongly disapproves of having milk intended for sale kept in or under a human habitation, and as you are compelled for the present to discontinue so keeping it, I would strongly urge you to make some other arrangement of a permanent character for the future. A family in which there are children is liable at any time to infectious disease. You have had scarlet fever this fall; before the winter is over, you may have diphtheria; it would then be necessary again to make another temporary disposal of your milk. You would certainly be wise to avoid such annoyances in the future."

We have in this State, laws for the protection of milk as a food supply in the cities. I think it goes without saying that no law executes itself. I think it has been a universal experience, that wherever we have a law that is intended to protect the public health, and morals more particularly, and in some particulars even public and private property, it is necessary to have a system of inspection, in order to enforce that law or to report to the appropriate powers cases in which the laws should be enforced. I, therefore, claim if we have a law for the protection of the purity of dairy supplies that it involves necessarily a system of inspection. Now I believe that inspection of milk, in order to be efficient, should begin at the dairy. It should be an inspection of the cattle, it should be an inspection of the stables, it should be an inspection of the water supply and should be an inspection of the methods of care of the cows.

The question of standards is also under discussion. In the first place, I desire to say that the State Board of Health must look at this question not from a commercial, but purely from a sanitary standpoint. It has been said that a man has a right to what he has paid for, and that if a man pays for pure mlk, he has a right to get pure milk. In other words, he has a right to get his money's worth. That, we have nothing, whatever, to do with, as sanitarians. I do not care whether a man who buys a quart of milk in Philadelphia pays twice as much as it is worth—that is no concern of mine; but it is a concern of mine if he buys milk, supposing it to be pure milk when it is adulterated milk; when it is watered milk; when it is milk that is under what has been declared to be the proper standard, and therefore does not cantain the proper amount of nourishment. I claim, notwithstanding great exception is taken to the statement, that it is possible to establish a standard for milk, even though the consent of the cows has not been obtained; and I can say in the first place, that the constitutionality of a milk standard has been decided over and over again by the courts. A Supreme Court decision holds that it is equally a fraud on the buyer, whether the milk which he buys was originally good and has been deteriorated by the addition of water, or whether in the natural state, it is so poor that it contains the same proportion of water that it would if it had been adulterated. The standard which had been fixed in this State has been 12.50 per cent. of milk solids. That is less than the standard of Massachusetts, where it is 13, but it must be admited that in Massachusetts they make an exception for that period of the year during which cows are eating fresh grass, that is, during the late spring and early summer; during those months they permit a lower standard, and I concede that they are doing a just thing; that it is right during the time that the cows are eating more succulent, juicy food, which contains more water, that there should be a lower standard. During that period I think they use, I am not quite positive, 12 instead of 13 per cent. The standard of 12.50 are also found in the city of Columbus, Ohio, Lansing, Michigan, Burlington, Vermont. In Massachusetts, as I have stated, and also in Minnesota, the standard is 13. In the city of Des Moines, Iowa, it is 13.13. The standard adopted by the society of British Analysts, which Dr. Leffman has mentioned, is 11.50. If our Board had any say in the matter, I should be inclined to favor that standard rather than a higher standard, because I believe, looking at the matter from a sanitary standpoint, that a milk which comes up to a standard of 11.50 would not be unwholesome milk for infants. You observe I am talking about infants, and that is because it is the infant in our large cities who suffers not only from infected milk, but from adulterated milk, and milk of a low standard.

The facts on which a standard is based are very numerous. I may, perhaps, mention one or two experiments. In the State of New York, the Dairy Commissioners examined the milk of 296 cows; these were milked in the presence of the inspectors, and care was taken that these cows should be under the conditions of ordinary cows, both as to breed, feed and as to housing. There was nothing unusual in the conditions of the cows. The result of this inspection of 296 cows was a minimum of solids of 12.53. In Massachusetts, a similar examination was made of the milk of 601 cows, and the result was an average of total solids of 13.26. A similar examination of the milk of a herd of 36 cows, mixed breeds, fed on brewers' grains, soaked malt-dust and pasturage, made by the Board of Health of Philadelphia, showed a result of total solids of 13.61. It will appear, then, from those experiments, that no one could possibly find fault with a standard of 11.50. One reason why a standard should be insisted upon is that there is a temptation to the milk dealer, if he is selling milk of an inferior standard, and especially if this milk is a watered milk, to give it the appearance of a rich milk by adding to it some coloring matter.

I desire to say in this conection that my experience and reading lead me to the belief that it is comparatively a rare thing for a farmer to water his milk; that adulterations of this kind take place with the middle man. I arrived at this conclusion from the fact that in small towns analyses show, and they have been made in the States of New York, Massachusetts and New Jersey, as well as in large cities, and the invariable result is that the standard of the milk is better in small towns than in large cities. I can attribute this to nothing else than to the fact that in smaller towns, the farmer himself is his milk purveyor. In large towns, it passes through one, two, and sometimes three hands. I would like to give you a little fact which came to the notice of the State Board of Health of Massachusetts; it occurred on one and the same day. They made an analysis of milk at a dairy in the neighborhood of Boston; that milk showed a standard of 13 per cent. A few hours later, on the same day, they examined milk from the same dairy supplied by a milk man in the city of Boston; that milk showed a percentage of 11.37; tracing the same milk, they examined it at a grocery store; here you see it had gone through three hands; at the grocery store that very same milk showed 9.84 per cent. This showed an addition in one case of 15 per cent.; in the other case of 25 per cent. of water, making a total of 40 per cent.

We have, as you are aware, in this State, two methods of testing milk, the one by the lactometer and the other as to the amount of solids by the Babcock tester. It has been objected to the lactometer that it is not a safe guide, because the specific gravity of 1.29-1000 will be indicated by a very rich milk, that is, milk very rich in cream and butter, which has yet been watered. The reply to that is, that that fact is unquestioned; but it is also a fact that milk which is rich in cream, is also rich in other milk solids; the two always go together, or almost always, as ordinarily good food, and the standard of 1.29-1000 is one which I don't think any one can find fault with. The examination of twenty thousand specimens, by twenty-two competent observers, gave a specific gravity of 1.319-1000. An examination instituted by W. E. Martin, of Albany, N. Y., of the milk of 700 cows, showed that not one registered less than 1.29-1000; not one out of 700.

As to the subject of coloring matter used for the purpose of masking adulteration by water, many persons doubt the fact of the use of such materials. That which is used, principally, as is well known, is annatto, which is made by macerating the seeds of a plant found in South America, drying that deposit, and then treating it with caustic potash. Now it is essential, in order to keep that material in its proper condition, that it should be kept moist, and it has been asserted by good authority (I will not vouch for it myself), that the substance used in moistening this material, (and it also has value in contributing to its color), is stale urine. However, that may be, this material has been carefully examined and analyzed by those experienced in bacteriology, and it has been found to swarm with bacteria, and also not only to contain ordinary bacteria, but the special bacteria or fungi which are found in stale urine;—that may have some weight, and it may not.

As to the annatto in the liquid form, that is a solution of that of which I speak, much adulterated, a case in which adulteration cannot be considered harmful.

To indicate the fact that preparations for "improving" adulterated milk have a very extensive sale among the milkmen, I will read two letters which were circulated among the milkmen in a large city of this country. The one is as follows:

"Dear Doctor: I would like to call your attention to (then came the name of the article which I can't furnish), for which I am agent. It is an article which all the milkmen in your city use to improve the quality of their milk, and to help them out when milk is scarce. It is perfectly harmless, and the milk inspectors and the State Board of Health cannot detect it in your milk. The amount of water you can add to your milk in one day without detection, will pay for enough of this article for use for three months. If you have any friends in the business, please tell them of this. Yours truly."

A short time later, the same party circulated the following letter:

"Dear Sir: Yours received. Sent by Adams Express, one bottle. Give it a good trial. Don't be afraid of the color, taste or smell, as you will find it to be all right when in the milk. A sample of milk taken from a batch put up with this article and analyzed, will prove to the inspector to be all right, as this article counteracts all the chemicals they have to use in the analyses. Yours truly."

Then followed certain directions as to the use of the article, and among these directions, occurred the following: "If you take the cream off from the milk, add a little more of the article. Some don't use sugar only when "sticking" their milk pretty hard. It gives a good body, however."

With regard to the question of inspection, I would like to call the attention of the Board to the fact that in certain agricultural regions, the dairymen have formed associations for this express purpose, so that they can confidently say to their customers that the milk which goes out from their dairies is the milk of sound cows which have had good food, good water, have been properly stabled and properly cared for; and it occurs to me that there are many regions in this State where such associations might be instituted with capital results. I would also like to mention the fact that a very prominent milk dealer in the city of Philadelphia, who controls a large number of dairies, has instituted such a system of inspection in all the dairies which supply his customers, and I feel that in taking this step, he has advanced the cause of pure milk in Philadelphia to a wonderful degree. The veterinarians whom he has selected to make these inspections are men of known ability, and I believe that this is a guarantee that the milk thus served is a pure milk.

There are many points of contact between the State Board of Agriculture and the State Board of Health. We are both interested in the question of the purity of food, the purity of milk and the purity of water supplies, and it has occurred to me more than once that on all these questions, our two Boards ought to stand shoulder to shoulder, and that whenever any of these great questions come up in such a way as to invite public attention, and especially in such a way as to call for legislative action, we should feel it to be our duty to cooperate with one another, and so far as possible, secure for Pennsylvania the name of being the first State in the Union for the protection of these great public and sanitary interests.

MR. EVES. Our creamery men and milkmen, in small villages, use what is called preservaline; do you know anything about it?

DR. LEE. In a general way, our Board has been led to think that every form of milk preservation is a substance which, to a certain extent, is a poison and which, if taken day after day into the system, and especially if taken into the sensitive system of a young infant, may introduce an injurious effect upon health. The substances mainly used are salicylic acid, salicylate of soda, boracic acid, borate of soda; and I am informed by Dr. Leffman today, benzoate of soda has been introduced. All these are medicinal substances, and if used in small quantities for a long time, would be poisonous, and our practice, therefore, would be to condemn all these for the milk.

MR. POWELL. After all, we must have the quality in our milk, rather than solids. Now, should not the sugar in milk have further consideration and more thought? Can you give us any information on that subject?

DR. LEE. In reply to that question, I would say, that I have no doubt that sugar, as we find it in milk, is an important constituent and food element of milk, and I do not believe that the excessively rich milk, as it is called, of the Jersey cow is a better food article, taking the whole milk as the food, than the milk of the average cow, the mixed breed. I believe that the very best milk as a human food is the milk of the mixed breed, and that the Jersey milk runs a greater risk of containing the germs of tuberculosis, while at the same time it also contains other constituents which are good food. I would call your attention to the fact that fat in itself is not the most desirable form which either a calf or human being can take. We don't want too much fat; we want muscle, we want bone, we want brain, we want nerve matter; and all these we get from the average constituents of milk, and not simply from the cream and the fat.

MR. POWELL. You consider that the "average cow" gives the best milk, that is, the mixed breed of cows gives the best milk for family use.

DR. LEE. Yes, sir; for food purposes, taking the milk as a whole product.

MILK STANDARDS.

EXTRACTS FROM LETTER BY DR. E. O. SHAKSPEARE, *Philadelphia, Pa.*

"The more I learn of this subject, of such vast importance to the general public, especially from the standpoint of the public health, the more I am convinced of the urgent necessity for reform in the laws regulating the production and sale of milk.

I believe that the bill which was introduced at the last session of the Legislature, by Senator Markley, constituting a comprehensive milk code for the State, and which was so unfairly killed in the Senate Committee on Agriculture, without an opportunity to perfect it by amendments, would, with some modifications, prove to be an untold blessing to the children of the poor and to the struggling farmer. The only alteration I would suggest in that bill, to make it what it should be, are, first, an increase in the indemnity paid the farmer for the slaughter of diseased cattle; second, the permission of sale of genuine, fair skimmed milk, and the total exclusion from the sale of so-called separator milk. The standard of milk fixed in the bill was, by a typographical error, named entirely too high. The other standards stated in that bill, I believe, after much impartial study of the question, to be entirely just as between the producer and the consumer. I believe that it is the middleman or city milk dealer whose practice and conscienceless greed are so often the bone of both the producer and the consumer. I, by no means, intend to intimate that the milk dealer, as a rule, is dishonest. On the contrary, I know that the great majority of them are conscientious and honorable men. But, unfortunately, both for the consumer and the producer, there are very many black sheep among them. Nor are the producers themselves entirely free from black sheep. These men not only bring discredit upon that class, but are, in the main, responsible for the lives of thousands of young children, annually.

I hold that legislation should be such as to drive them out of the business of producing or selling milk.

I feel that the least that should be done in the interest of the public health, and of the milk producers throughout the State, is the general extension of the milk act of 1885, so that its provisions shall cover the whole State, and not alone the cities of the second and third class.

With respect to the legal standard of the quality of milk sold, I hold, on the ground of common sense and common experience, that neither the farmer nor the milk dealer, nor their employes, whether they (the latter), be called chemists or not, are the people to judiciously determine what the standard should be. This is a question that should be decided by experts, and experts alone who are entirely free from any bias or self interest in the legislation. You have a Department of Agriculture at Washington, organized and conducted for the best interests of the farmer. Let the competent experts of that department be made the impartial umpires for the determination of that question, which is of the greatest importance to the dairymen and to the parents of young children."

MILK INSPECTION AND MILK STANDARDS.

ADDRESS BY CAPT. A. A. SLACK, *Breadysville, Bucks Co., Pa.*

This is the first time that I have had the pleasure of attending one of these meetings, but I listened with a great deal of interest to the proceedings, and hope with some profit. I want it distinctly understood that if I say anything which might seem personal, or mention some name, that I have no issue with any man, farmer or dealer. And I further state, that if we have too much milk-law, repeal them; if we want new laws, let us have them enacted. I act on the principal all the time of "the greatest good to the greatest number," and of no legislation which is in favor of any particular person or any particular class.

I heard something said that I cannot altogether approve. Dr. Leffman said that infant mortality was largely due to milk being diluted with water or otherwise. While there may be contagion in the milk, while disease may be carried in it, we don't believe that that is the cause of infant mortality, because we have known infants and little children come to the country and thrive whilst there; and when they returned to their homes in the cities, they would hardly be known; and we also know that they use a great deal of milk when they come to the country. He says if there is a standard, it should be a minimum of the average; we don't think that, either. A bad hay season makes poor milk. We believe that poor feed makes poor milk, notwithstanding Mr. Abbott's assertion that the quality of milk is not improved by feed, only the quantity increased. We say it is unfortunate that Mr. Abbott made that assertion. I have a German who works for me, and he stated one day when I gave him a little taffy, "you don't believe yourself when you talk." Mr. Abbott knows when he gets my milk whether the cows were fed on brewers' malt, potatoes, carrots or cabbage.

Dr. Lee says that inspection is a necessity; that disease is carried by milk and some plan should be devised and some law enacted to stamp out tuberculosis. We know it is prevalent. I know of a large number of cattle killed recently because affected by tuberculosis. We are in favor and will stand in favor, shoulder to shoulder, to help enact a law to help stamp out tuberculosis—we certainly agree on that point. We knew of a typhoid fever epidemic along the Delaware, and they could discover no reason why there should be an epidemic. The sanitary arrangements all around were perfect, and they came to the conclusion that the germs of this dreaded disease came from the milk. They watched the milkman, but it did not come from the cows; they afterwards saw him fill his cans from a certain pump, examined it and found it came from there.

One gentleman has said that calves are not so thrifty when fed on Alderney milk. We do know that Alderney calves are never fine and beefy like other calves; I never had one of that kind. I notice when I have an Alderney and the sire is a Holstein or Durham, I have good calves.

Professor Cochran says that separator milk is a good food, but not as good for babies, as the human milk, because the protein of milk is too abundant and more difficult of digestion. We believe that it is not good for babies, and in that connection Mr. Abbott has again shaken our confidence. We say it is unfortunate, because he told us so many things we knew, and so many things we did not know. There may be some things in Mr. Abbott's address worthy of belief, but having shaken our confidence in some things that he expressed, it may interfere with some elegant truths that he has set forth. Take for instance, his likening separator milk to roast beef with the fat off; I think it would have been better had he likened it with beef from which tea is made, with all the juice extracted; if he had taken that illustration, it would have been all right.

If there is any law enacted, let it be made so as to be of the greatest good to the greatest number, and least possible harm to any one. Is there any law in existence that does not oppress somebody? The man who wants to sell liquor on Sunday thinks the law is oppressive, and that one thousand dollars is too much license to pay, but when he embarks in that business, he knows that there are certain restrictions placed upon him. He knows when he violates the law that he is liable to fine and imprisonment, and I say that the law has no terror to the upright man, but only to the evil doers.

MILK INSPECTION AND MILK STANDARDS.

ADDRESS BY HENRY COMFORT, *Falsington, Bucks County, Pa.*

I am an advocate of the inspection of milk, not by a system of standards, but by an inspection that will go into the dairies and producers of milk at their places of business, and there have a practical demonstration of the character of the milk that is being handled. One of the speakers spoke of a producer of milk who had large gutters and troughs in his cow-stables, and that they laid on wire matting, and every two weeks these were cleaned out. I do not believe you would think that that was good, wholesome sanitation. No man would want to raise an animal over an offensive vault of that kind, and we do not believe that good milk can be produced with such surroundings.

The farmer seems to think that whatever is easiest, or, at least some of them, in his work, or whatever will get the greatest amount of work, is the most important thing for them to consider, and they pay no attention to the sanitation of their stables and the health of their cattle; and as the great argument for milk inspection has been the health of the product, is it not wise for us to investigate the dairies and the milk supply of the State regularly? We do not want to simply investigate the amount of solids, whether it has 11, 11½, or 13½, per cent. as not being of much effect on the public health; but, whether it is a diseased product, whether the milk is setting around in contact with the disease germs which may be there, is of much more importance than the question of standards.

In regard to the question of feeding, I would like to say one word: Can we make good milk by feeding, or can we not? I did believe that once, and started out by raising the quantity of milk by using Holstein cows, but could not feed the Holstein up to a large product. It is not possible, we know, to starve a Jersey down to the Hereford, or feed a Hereford up to the 12 or 14 standard of Channel Island breeds. I don't think it would be well to have it go on record by this Board that feed has no effect on quality. We have to feed to some extent for quality and for quantity.

We hope there will be some legislation, first in suppressing the disease of tuberculosis among cattle. Then, if you wish to go further, go into the dairies and use that good sense that should be manifested on the part of all successful men who are disposed to furnish a healthy product to their customers, and have cleanliness in the production of the milk, rather than whether we have 11½ or 12½ per cent. If we have it high, Mr. Abbott says that it will oftentimes result in the conviction of innocent men. If we have it low, the avaricious and dishonest would water it down to a lower standard.

I have a large dairy, and in my experience with it, I feel that what we need most, is milk of a good, first-class, dairy cow, fed with wholesome food, and good food and exercise, cleanliness in the stables where the cows are kept, and also in the handling of the milk, so that we will have it as clean and pure as possible. I believe it is all important to know whether we have good milk; and this can only be known by seeing that all the surroundings are favorable to its production. I believe this is more important than whether it be 11½ or 12½ per cent. or any other amount of fat. If you attempt to legislate on the question, I doubt very much the wisdom of it. Parties have attempted to have acts passed prohibiting the sale of skim-milk. I contend that we have no right to say whether the milk shall have 2½ or 1½, as the bill proposed last winter, or whether it is policy to prohibit any skim-milk.

It has been said that it is detrimental to the public health to feed separator milk, and I suppose the physicians that were here will agree with me that if there be any impurities in the milk, that the centrifugal force throws them off. If all the fat were taken out, there is still another element of food in it; it is certainly a food product which is very valuable and ought not to be taken out of the market. A great many milk dealers have a good trade for skim milk, and we believe it is good government to allow a wholesome product to be sold. We believe the passage of such an act were for the purpose of enlarging the market in behalf of selling new milk, rather than serving the public health.

MR. MCCRACKEN. Regarding the sanitary question, there is a wide difference of opinion as to the proper treatment of cows in the stables, and I know it is the practice of many of our dairymen, especially in the western part of our State, to use the grated floors, that you abuse in your address; and it is the practice of some of our other dairymen to keep their cows in box-stalls and leave the cows stand for quite a considerable time on the straw and manure combined, and each of those practices have their advocates. Now we have your idea concerning a grated floor. What is your idea of a boxed stall?

MR. COMFORT. From a standpoint of saving the greatest amount of manure, probably it is best saved in the box-stall, and if dragged out and spread on the land immediately, it is the most economical method. But a large amount of straw and manure generates gases and unwholesome surroundings. The best consensus of opinion is that the nearer you can obtain surroundings free from dirt, the cleaner the bed, the better the quality of the milk and the healthfulness of the milk and animal.

MR MCCRACKEN. Could those objectionable features be overcome by the use of plaster?

MR. COMFORT. In listening to ex-Governor Hoard, the opinion was advanced favorable to plaster as holding the gases. He is very particular to have the stables of his patrons scrupulously clean, using plaster night and morning to keep them clean; thus, a little ensilage left in the stable will sour; that a bucket of milk sitting there an hour or so will seriously affect the quality and good taste of his best butter. He also stated that he had a certain difficulty with cheese in one factory. Every man's milk is analyzed every day and paid for according to butter fats. They found that there was something the matter with the cheese, and they separated every patron's milk for a few days and located it on one farm, and made up their minds that those cows were drinking some foul water. They went to the farm and found the cattle were drinking water from a pond in the centre of the field, and that the cows stood in there. They prevailed on that man to fence that off and drive them to another place to water them, and the trouble was at once removed. I believe that your milk vessels and everything connected with its production should be kept absolutely clean.

MILK INSPECTION AND MILK STANDARDS.

BY GEORGE ABBOTT, *Philadelphia Pa.*

I feel that this is a very opportune time to discuss the milk question before the State Board of Agriculture of Pennsylvania, while a year removed from the heat attendant upon efforts at legislation. Therefore I rejoice in this opportunity to have this subject discussed, and laid before our thinking agricultural members.

I am in full accord with all that is by way of encouraging legislation looking towards the suppression of contagious diseases among cattle, and feel that it is but right to say here, that the Guernsey Breeders' Association, which held their annual meeting yesterday, adopted a resolution which would have been presented here today, had not the secretary of the association missed the train this morning. However, he has telegraphed, asking that the substance of the resolution be stated, which is about as follows: "The Guernsey Breeders' Association realizing that tuberculosis is in a degree present amongst the dairy cattle of our State, think it necessary that measures should be adopted for the extermination of the disease, and believe that the best disposition that can be made of this subject, would be to place it in the care of the Governor and the Secretary of the State Board of Agriculture, as has been done in this State in the case of pleuro-pneumonia."

The impression was given out by a previous speaker that you might find that tuberculosis is more prevalent among the Channel Island and other registered cattle than among common herds. With reference to this, I would state that some recent experiments have been made with tuberculin, in the State of Delaware. Twelve herds were tested, with the result that in five common or grade herds, 53 per cent. were found to be affected; in six Channel Island herds, 12 per cent., and in one Holstein herd, 8 per cent. were affected. We should be careful of drawing conclusions from too limited data, but so far as this experiment goes, it is in favor of the registered cattle.

I am in full accord, individually, with what has been proposed by the Guernsey Breeders' Association, that the proper place to rest this work is with the Secretary of the State Board of Agriculture and the Governor. We want to approach this question in the line of building up, and not of tearing down. We do not want to frighten the people into the belief that they are using impure milk; I think the trade has already suffered from statements to this effect. Agriculturists should meet this problem very much as our United States government met a similar one, in the effort to introduce our meats more largely in European markets. The Bureau of Inspection, in Chicago, was not instituted to prolong life in Europe, but to open up a better market for our products.

Notwithstanding the strenuous effort that has been made to establish that tuberculosis is transmitted to the human family, through the medium of milk, it is yet far from satisfactorily proven that such is the case. While it thus remains unproven, is it worth while to assume the worst? Is it not more reasonable to restore confidence by exhibiting to our population that agriculturists and those interested in dairy products are working with a view to eradicate this disease from the herds of the State? We have heard, to-day, that the State Board of Agriculture is able to work very smoothly with the Legislature. It certainly can work harmoniously with the farmers also in this line, and thus obtain their aid and co-operation in order to secure the extermination of the disease.

Another important point is the question of reasonable compensation for cattle destroyed. It is sometimes said that a tubercular cow is not worth anything, and asked why the owner should be paid because of her destruction. But, sometimes, one-half of the animals that are eliminated by the tuberculine test, give no physical manifestations of the disease, and are doing good work in the dairy. It is only reasonable that the public should help pay for the loss of cows that are yielding their owner good returns, seeing that their destruction is ordered for the common good.

With regard to milk inspection and milk standards, we are ready to accept inspection if reasonably conducted, and have been ready for years; but as to what shall constitute a proper inspection, there are three central points or features of difference, on account of which, for ten years past, the battle has been waged backwards and forwards. These three central points of difference have been and are: First, "Shall there be guilt irrespective of knowledge?" secondly, "Shall there be limits for solids in milk, fixed by law, and if so, what shall these limits be?" and thirdly, "Shall the sale of skim milk be permitted, or prohibited?" Some who have presented milk bills for enactment, have claimed that the holder of the milk must be held absolutely responsible for its character, irrespective of his ability to ascertain the same. The opposition claim that this is unreasonable, and that when you make it a crime or penal offence to have in possession for sale, milk of a certain description, that then it is absolutely wrong to ignore the presence or absence of a guilty knowledge, not of law, but of fact. If the producer of or the dealer in milk was handling a manufactured product into which he could put certain component parts for a given result, as in the case of fertilizers, there would be no material hardship in demanding that he should have a knowledge of the chemical composition of the article in question. On the contrary, he is concerned with a natural product, and one of extreme variability; and furthermore, milk is a perishable article that must, of necessity, be sold before it can be analyzed and its component parts be known. To thus make imperative that the holder of milk should secure an analysis in advance of sale, when it is impossible so to do, is simply tyranny.

A previous speaker informed you that European governments have instituted inspection, and it is but reasonable that we should follow in their footsteps; but let me tell you they reject these three objectionable features that some are striving to make a part of inspection in a few of the States of our Union. A clause of the British adulteration act, under which milk prosecutions are conducted, is as follows:

"That no person shall be liable to be convicted under either of the last foregoing sections of this act in respect to the sale of any article of food, or of any drug, if he shows to the satisfaction of the justice or court before whom he is charged, that he did not know of the article of food or drug sold by him, being so mixed, colored, stained or powdered as in either of those sections mentioned, and that he could not with reasonable diligence have obtained that knowledge." I would further call your attention to the general adulteration act of the State of Pennsylvania: "If any person shall sell or expose for sale, the flesh of any diseased animals, or any other unwholesome flesh, knowing the same to be diseased or unwholesome, or sell or expose for sale, unwholesome bread, drink or liquor, knowing the same to be unwholesome; or shall adulterate for the purpose of sale, any flour, meal, or other article of food, any wine, beer, spirits of any kind, or other liquor intended for drinking, knowing the same to be adulterated; or shall adulterate for sale, or shall sell, knowing the same to be adulterated, any drugs or medicine, such person so offending shall be guilty of a misdemeanor, and upon conviction, be sentenced to pay a fine not exceeding one hundred dollars, or undergo an imprisonment not exceeding six months, or both or either, at the discretion of the court." You see that the guilty knowledge feature pervades the section all through. Now I ask why our legislators are asked to single out milk producers and dealers, and place them in a different category? In the case of most of the articles recited, it is possible to acquire the requisite knowledge, but not so with milk. Why these invidious distinctions, not requiring knowledge where it is possible to obtain it, and requiring knowledge where it is impossible to obtain it? Is it any wonder that our legislators have refused to inflict such injustice upon the milk interests? Seven of our States only have legislation upon their statute books affecting milk, embracing the two features of guilt without knowledge and the establishment of legal limits. We shall see as we go on how satisfactory it has proven. New Jersey gave this sort of legislation a trial, but has amended it to give some relief. Martin Grey, of the firm of Grey & Grey, of Camden, who had defended a number of cases, wrote in 1890: "Under our law, it is no defence that the party charged did not know of the deficiency, or that he had no means of knowledge. I have tried almost all of the milk penalty cases in our end of the State, and in the earlier trials sought to interpose the defence of want of knowledge, or to offer evidence proving conclusively the absolute impossibility of knowledge, as in the case of the dealer to whose wagon at the railroad station, milk has but a moment before the seizure been delivered. The mere statement of this case shows at once that knowledge of the character of the milk was impossible to the dealer. In all these cases the judges ruled, as they were obliged to rule by the terms of the law, that want of knowledge of the deficiency in solids, or physical impossibility of ascertaining the deficiency, was not admissible as a defence. The result in my experience has been that the manifest injustice of enforcing a penalty upon an innocent dealer, acting in good faith, has disgusted the juries, so that, notwithstanding the directions of the court and despite the evidence being excluded, the juries, disregarding, of course, their oaths, have often refused to find the dealer guilty. I regard this as a most unfortunate situation, where positive law does not comport with natural justice, so that juries are placed in a position to be tempted to despise their obligation to return their verdict according to the evidence."

I will read from a letter of Charles E. Hendrickson, of Mount Holly, for many years prosecuting attorney for Burlington county, New Jersey. He says: "I have always insisted and now believe that the word "knowingly" should be inserted in these sections declaring the offense and its punishment. As it is now in this State, I understand that courts are bound to instruct juries, and do, that if they believe the analysis correct, they must convict, regardless of any want or absence of guilty knowledge." As stated, the law was found to be so obnoxious in New Jersey that it has been amended.

Now as to "Milk Standards." In all Europe as far as I have been able to learn, no government has established a legal standard or limit, and yet a recent speaker referred us to Europe for illustration of inspection. I wish we might copy after Europe. I wish our legislators would copy after Paris, where a valuable illustration of enlightened food control is to be met with; where each police station receives samples of food, etc.; these samples are analyzed at the Municipal Laboratory, gratis, and certificates of analysis given the furnishers of samples. The Chef du Laboratoire, Girard, states: "Thus enlightened by certificates of analysis, they (the buyers), can change the furnisher and seek elsewhere such food and drink as would be worth the price they are willing to give, and that will repay the trouble of their search. This abandonment of the adulterating vender by his cheated client constitutes for the former a pecuniary punishment not less severe than the fines inflicted in courts."

Dr. Vieth, formerly of England, now of Germany, who has been quoted here, is a very eminent and largely experienced authority upon milk analysis. He says: "The difficulty of fixing standards for natural products is universally admitted. Nature does not allow herself to be confined within narrow bounds, but delights in pleasant variations. More than with a great many other natural products, is this the case with milk, and I do not think it is saying too much, that a real standard for any given sample of milk can only be furnished by a corresponding sample of the same milk taken before any interference has been possible."

Dr. James Bell, Chief Analyst at the Government Somerset House Laboratory, London, in the opening speech at the conference on food adulterations, held 1884, stated that Parliament deliberately abstained from fixing limits of quality for natural products, whether in a raw or prepared state. Dr. Bell further stated that whiskey, gin, rum and brandy are the only articles which are required to be sold at not less than a specific strength, unless otherwise declared at the time of sale, and then adds, "These spirituous liquors are in a different position to natural products, for being in all cases mixtures of manufactured spirits and water, the relative proportions are readily ascertainable; and further, in his work on 'Analysis and Adulteration of Foods,' he states: "The application of a uniform standard, which would operate alike fairly to consumer and vendor, to a natural product like milk having a wide range of quality, is a problem of which a satisfactory solution may be almost regarded as impossible." He goes on to say: "It is frequently urged that certain limits founded upon the analysis of samples of average quality should be laid down and legalized for natural products, below which such products should be deemed to be not of the nature, substance or quality of the article demanded; but the adoption of such limits might lead to grave difficulties. It is the opinion of practical men that it would be unwise to adopt any legislative measure with respect to limits of quality which would tend to discourage production and diminish the supply of any article of food. It would manifestly be an economic blunder, if, for instance, in order to raise the quality of milk by one-half of one per cent. on the non-fatty solids, the actual production were to be diminished by ten per cent. in quantity," because that would enhance the price.

Now, to come nearer home, take the late Professor George H. Cook of New Jersey, who was so long the honored head of the New Jersey Agricultural Experiment Station, who wrote: "The state law requiring 12 per cent. total solids in milk is not too high for general interests; but it should be so amended as to protect innocent parties from being charged with criminality, on account of failures to which they are liable." Dr. E. H. Jenkins, Chemist at the Connecticut Agricultural Experiment Station, in his report for 1882, says: "It is a matter of great importance to know not simply what is the average composition of herd milk, but what composition it may have; what are the limits within which pure herd milk comes, and whether it is practicable to establish by law, or by regulation among dealers in milk, a standard of composition which shall distinguish pure milk from that which is watered or skimmed." Here, today, I heard Dr. Lee speak of average milk, and I pricked up my ears, for to make "average milk" the limit, simply means to kill half the cows. Nearly all this milk legislation fixing limits is based on averages. I cannot imagine how it is possible that this point has not arrested the attention of legislators. To adopt averages for limits really means to condemn more than one-half of the cows, because they will take their turns in giving low results. We have just been told that they found average milk to yield thus and thus in different localities. Why do not they tell us how low they found the milk? That is what legislators should know. Again, in the same report, Dr. Jenkins says: "If we will establish a minimum limit for the percentage of solids and fat, which shall in no case condemn pure milk in any locality, we shall have to make it absurdly low." That is just the objection laid down today by Prof. Cochran: "If you are going to make a limit, you must make it low." There is, however, no occasion to make such legal limits. A man that has had a life-long reputation for honesty has a great deal to lose if charged with selling adulterated milk, and if fined and imprisoned in consequence. It does not make any difference under the laws of these seven States, if it is above this limit for 364 days of the year; but if it goes below that limit on the 365th day, he is liable to be advertised in the newspapers, and to be put in jail for selling adulterated milk. Certainly, it is the limit, not the average, that concerns him. As a matter of fact, of the common herds of this country, five out of six produce milk that goes below 12 per cent. of solids, at times.

Let us come down for a moment to the recent results at the Columbian Fair, and notice the analyses in that 90 days test for those Short Horn cows. They were animals picked from the whole United States for their peculiar merit as butter makers. What results do we find in that test? Fourteen days out of the ninety, the milk of those picked Short Horn cows was below 12½ per cent. in solids, the standard that is asked for in Pennsylvania, and that now established in Pittsburg. This was not the result from individual cows, but from a herd of 25 cows.

In the New Jersey Agricultural Experiment Station report for 1883, may be found analyses of milk of known purity, from 12 herds, taken monthly throughout the year. The highest analysis was 15.47 per cent., and the lowest, 11.67 per cent. The milk of six of the twelve herds fell below the state legal limit of 12 per cent. upon one or more occasions.

Had the milk been tested every day, instead of once, monthly, the number of low results would, of course, have been greatly increased. Again in the New Jersey Experiment Station report for 1890, will be found forty-two analyses of milk of Ayrshire, Holstein-Friesian, and Short-Horn herds for August, 1890. Of these analyses, twenty-one fell below 12 per cent. total solids; while the average was but 12.11. As at the recent Chicago test, these cows were sent to the station to compete in a butter contest of the breeds, and, as a matter of course, the breeders sent their best butter animals. Thus the best cows for that month did not keep up to the State's legal limit more than one-half the time. The breed, time in milk, and climatic influence have almost everything to do with the solids in milk. Feeding has little or nothing to do with the result; two or three years ago we would have regarded that as heresy. In Denmark, there were over 1152 cows in 112 lots, on 9 farms, placed at the disposal of the National Bureau of Agriculture for five years, for test and experiment, with the result that changes in feed were, practically, not at all traceable in the chemical composition of the milk. An experiment conducted at the Ontario Agricultural College gave similar results.

SECRETARY EDGE. "That is to say it does not influence the quality of milk but the quantity."

MR. ABBOTT. That is correct. This deduction is further corroborated by the results of experiment at Cornell and at the Illinois Experiment Station. The advocates of high limit used to say, "feed your cows up to the limit"; but it is now demonstrated that feed will not bring the result. I had analyzed weekly, last year, the milk of 26 grade Jersey herds; 18 of the whole did not at all times keep up to 12.5 per cent. total solids. With a standard of 12.5 per cent., I ask, what would be my position in receiving the milk of these high grade Jersey herds? In addition, we found also amongst these high grade herds, four shippers that shipped milk below 12 per cent. Now I won't say whether it was adulterated or not, but I do say I did not have the chance to adulterate it. Taking the kind of law that some parties want to place on the statute books, I would have to hire deputies to help me serve out my terms of imprisonment, and I am sure that I could not pay all the fines.

Dr. Lee has spoken of the great honesty of the farmer, and claims that the dealer adulterates the milk. I consider this a slander. We have had milk inspectors in Philadelphia for three or four years past; they have required milk to stand 106 to 108 by the lactometer, and yet they report only 5 per cent. to 10 per cent. of adulteration. What tradesman could make a better showing? I believe that the milk business of Philadelphia is in particularly good hands; that we have a set of dealers, and have had for the last fifty years, who have done a straight business, who have sold and do sell the milk as good as they receive it.

Marshall & Cochran, milk analysts, had throughout the year 1892, under their supervision, the milk of 250 herds supplying milk to Philadelphia, with results as follows: Total number of analyses, 10,927; number below 12.5 per cent. of total solids, 3,352; below 12 per cent, 1,041; below 9 per cent of solids not fat, 9,150; below 8.5 per cent of solids not fat, 2,328. Of the 250 herds, the milk of 245 did not at all times keep up to 12.5 per cent., and that of 210 herds did not keep up to 12 per cent of total solids. Samples were taken upon the arrival of the milk at the station in the city. If pure milk never falls below 12 per cent. or 12.5 per cent., total solids, must we not conclude that it is the farmer who adulterated the milk, instead of the dealers?

We have been told about the limit of 13 per cent in Massachusetts. My brother, who does my analytical work, a year or two since purchased in Boston, 30 samples of milk of retailers. Twenty-two of the thirty, upon analysis, fell below the standard of 13 per cent. I have a letter here from which I will read a paragraph. You know who Professor James Cheeseman is; a dairy expert of unsurpassed ability and qualification. He says, speaking of Boston, "The pretence that all milk sold is 13 per cent is a farce, and every one knows and admits it; but the fear of watering keeps the legislature from amending." Here is the error of standards; that is, the reason there should not be standards. The chemist should simply go before the court and state, that upon an analysis made, in his opinion, such and such milk was adulterated, whether it had 12 per cent, 13 per cent. or 14 per cent. solids. Adulteration is much better indicated by the disturbance of the relative proportions of the component parts, than by comparison with any limit.

Professor Cheeseman says further: "We have a sensible inspector who winks at a great deal of milk between 12½ and 13 per cent. That is all very well for the man who knows how to wink back. I contend that legislation of this kind is in the interest of dishonesty. Why have you seen honest and meritorious dealers coming here to Harrisburg to oppose proposed milk legislation? Because they are straight and honest, and do not want to be at the mercy of unprincipled inspectors. A law that makes it to a man's interest to be dishonest and his misfortune to be honest, ought to be vigorously opposed and condemned in the strongest terms.

The Chemist of the New York Experiment Station has written me as follows: "I wish to acknowledge the receipt of the leaflet sent by you. I am very glad you have taken this matter in hand, and have so clearly shown the fallacies upon which so much of our legislation has been based. I have for some time had it in mind to call attention to some of the inconsistencies of our New York State law pertaining to standard of milk. I have rarely found that milk that contained 3 per cent. of fat contains as much as 12 per cent. total solids, which the law says it must contain. It is time the light of more recent investigations should be thrown upon the hasty conclusions, as well as the imperfect work previously done. The legislation upon our books pertaining to milk seems almost farcical when we come to see the incorrect and untrue basis upon which so much of it rests. I am heartily in sympathy with your efforts to correct the errors that now are so generally prevalent. I want simply to see truth (science) prevail." You can see how the New York law is regarded by an eminent authority in that State.

Now a few words regarding the milk legislation at present in force in this State. There was an act passed in 1869, empowering the councils of cities and boroughs to provide for the inspection of milk. In 1878, a General Act was enacted prohibiting the adulteration of milk. It has been largely enforced in Philadelphia, and there has been no difficulty in securing convictions under it. Next came the act of 1885, the Pittsburg Act. Of all the monstrosities of legislation that ever defiled any State statutes, that act of 1885, is, perhaps, the greatest. I think it the most ridiculous, contradictory, absurd and unintelligible piece of legislation that ever got on our statute books. Philadelphia milk interests took no pains to resist it when it was passed; but when the attempt was made to apply it in Philadelphia, we resisted it successfully in the courts, though the inspectors continued to harrass the dealers with it.

Our Philadelphia ordinance is more reasonable, as it contains the following clause: "No person shall be liable to the penalties under this ordinance, if he shows to the satisfaction of the magistrate before whom he is charged with any violation thereof, that he could not have ascertained that the milk was altered, adulterated, impure or unwholesome." You will notice, this clause resembles that of the British adulteration act. While limits were fixed in the ordinance, it is held that there was not authority for it under the act of 1869. It is also said the city has not the power to imprison for the recovery of a fine.

The amount of solids in milk has little or nothing to do with sanitation. I agree with Dr. Leffman, and disagree with Dr. Lee in this matter. Milk simply furnishes the base from which is concocted a ration for babies; cream and sugar are often added, and almost always copious additions of water are ordered by physicians, usually from 33 per cent. to 60 per cent. It is infinitely more important, in order to secure perfect sanitation, that the most scrupulous cleanliness be observed, from the milking pail to the bottle from which the babe takes its milk. The attention of inspectors is taken up with testing for solids in milk, a commercial matter; and though they are health officers, sanitation receives scarcely any attention at their hands.

As to the effort to suppress the sale of skim milk, I think it is a very bad thing for people to come to the legislature of any State to gain an advantage over their neighbors, and outside of the inspectors, this is the animus of the anti-skim milk movement. The inspectors want to simplify and ease their work by securing that there shall be only one kind of milk to inspect. He who has skim-milk to sell, has just as much right to market it as he that has whole milk. It is commonly objected that if we admit skim-milk, it is likely or liable to be used in adulterating whole milk. Let us look at this plea for a moment: Take New York City, where skim milk is prohibited; a dealer needs a few quarts of cream a day for his customers; how is he to get it? Will he send up to Orange county or Washington county for it, or take it off his whole milk? The temptation is to take it off his whole milk. Again, is not every one who is supplied with whole milk able to secure skim milk for the purpose of adulteration, if he desires so to do, by simply taking off the cream? There is a demand for cream and a demand for cheap milk; the temptation is to meet both by robbing the whole milk of its cream. The law forbidding the sale of skim milk for what it is, encourages its sale for that which it is not. Thus, legislation defeats its professed object. I consider it one of the greatest misfortunes to the agricultural and dairy interests that any branch or portion of the agricultural community should think that it is justifiable, or to their interest, to endeavor to suppress the sale of skim milk. The health authorities have joined in the hue and cry, and, as a matter of fact, the sale of it is prohibited in New York, Newark and Jersey City.

Skim milk affords a wholesome and cheap food for the million. Families which use a quart of whole milk, should use in addition two or three quarts of skim milk. It is asked, "would you feed a baby on skim milk?" Certainly not; neither would we give it a diet of roast beef, nor of granulated sugar; but is that any reason why we should not sell beef and granulated sugar? Neither is a skim-milk fed to infants, but is bought by the pitcher full as a drink, and is used in making bread puddings. It is used as a part of the ration in a mixed diet. Protein is largely found in skim milk, and is obtained in this form at low cost. You know that protein is the expensive portion of our food; it usually costs about 25 cents per pound. Skim-milk is equivalent to roast beef, with the fat trimmed out.

If instead of this agitation against skim-milk, our health authorities would strive to make the people appreciate its great value, if our farmers recognized its value, instead of decrying it, as some are doing, good would result to producer and consumer. If the inhabitants of Philadelphia were brought to appreciate the value of this food, I believe that, whereas, now the City of Philadelphia is consuming annually only about one hundred million quarts of milk, it would consume two or three hundred millions of quarts, annually.

Farmers tell us that we cannot compete with the West. What is the natural thing to do? Certainly, to produce those commodities in which the West cannot compete with us. They cannot send skim-milk from Iowa or the Dakotas to the East. I believe that skim milk should take the place of coffee, and of beer also, as it is both feed and drink.

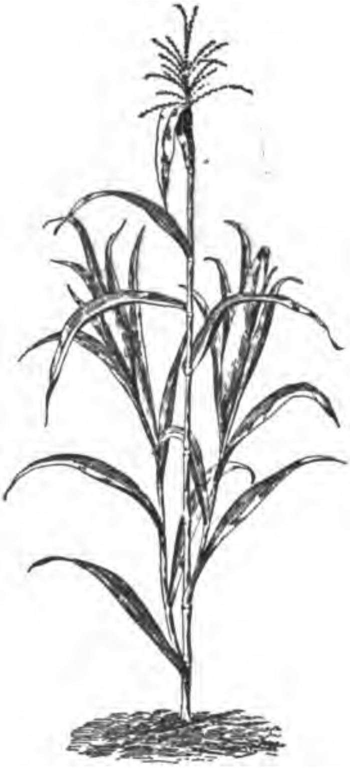
Some may think that only patrons of creameries would be benefited by the sale of skim-milk. But, if the creamery proprietor gets an additional profit, does not this at once make him a stronger bidder against the city dealer, and would not the result be that prices would be improved all around? I cannot see why our agriculturists are not impressed with this view of the case. The consumers would be helped in securing cheap, wholesome food; the farmers would be helped to a better market; every one would be helped, and in my opinion, it would be a blessing without a drawback.

REPORTS OF HONORARY OFFICERS.

REPORT OF THE BOTANIST.

By THOMAS MEEHAN, *Botanist of the Board, Germantown, Pa.*

Much of the work of your botanist in connection with his official duties have been, as heretofore, the naming of unknown plants sent to him by correspondents, usually from those who were anxious to identify strange weeds. Aside from this there has been more than usual correspondence in relation to the improvement of fruits and plants, and it may be worth while to note that the general principle on which nature works in making change has not hitherto been well understood, and yet in more recent times knowledge has progressed faster than might have been expected. It was at one time the general belief that plants were originally made we now find them, and that what little variation may be found among them was a very slight improvement of no more importance, indeed, than the difference in feature or form among individuals of the human family; and that outside of this slight variation, for perhaps identity sake, no new species was ever introduced since the first establishment of the general order of things. With the incoming of what is known as Darwinian views, a sudden jump was made to what appears to be the other extreme. It was thought that everything was subject to change, according to circumstances. That when a plant, for instance, had been growing for ages in a comparatively wet piece of ground, and then by some circumstances should find itself confined to drier regions, the plant would take on a change of form in order to adapt itself to the new requirements, and in this way new forms and species would originate by reason of the external conditions acting on vegetable life. More careful observations, however, show that although these external conditions may make some change, it rarely results in any marked deviation from the typical form; but, as we know there has been evolution of form—a fact which is readily proved by the study of fossil remains, it is still a subject for broad intellects to try to get at the law by which these vegetable forms are changing. While the idea of general fixity prevailed it was thought that we could only obtain new varieties by hybridization. Hence, when any marked difference from a normal form appeared wild, it was thought to be a natural hybrid between the two species, and therefore hybridization and the changing of the environment so as to act on the organism were regarded as the only two methods by which any marked deviation from a normal type could be obtained. The advance recently cently made, and already referred to, however, seems to be in the direction of the belief that it is by some internal energy that new forms develop from older forms, and that this energy operates by reason of some condition of the nutritive forces. Just in what way this operates is yet to be cleared up. New forms will appear with a suddenness that is surprising. One may have thousands of peach trees or mulberry trees or willow trees or of any tree growing perfectly upright, and all at once one form will appear with weeping or pendulous branches. Thousands and thousands of maples, beeches and birches have been raised, all coming with normal green leaves, when all of a sudden one will appear with purple leaves. And what is true of habit or color is true to the forms of fruits or seeds or of any other character valued by the agriculturist or horticulturist. Those, therefore, who would improve any particular race of fruits, seeds or flowers, will gain far more by watching these little wanderings of nature from a normal type than they will do by any process of hybridization or culture. It is indeed true that cultivation will make fruits or seeds larger than they would do in a neglected condition, and it is generally believed that under the laws of heredity any character thus acquired may be communicated to its descendants. Under this belief raisers of vegetable or agricultural seeds always prefer to save the finest and the best for seed. The larger ear of Indian corn, the larger tomato, or even the larger potato, in the minds of many good agriculturists is selected for seed under the belief that it does, to some degree, affect the progeny, as indeed it doubtless does; but the best results are obtained by selecting the individual plants, and not merely individual fruits, which show some disposition to wander from the type in the direction which we desire, rather than from a large fruit or seed from an individual tree. To illustrate the point here made, a cut is annexed of a branching corn.



This one plant occurred among hundreds of others in the same corn field, which have no branching character, and yet all from precisely the same lot of seeds. Instead of sending up one tall stalk with one or two ears of corn, branches have come out from the lower portion of the stem, and each branch has its separate corn bearing system. No condition operated on this plant any more than on the other plants, but it branched under some internal law with which we are wholly unacquainted. If seeds were taken from this branching corn and planted, under the law of heredity the larger number of seedlings would be branching as this parent plant has branched. A further illustration might be introduced in regard to the color of grains. There are white, yellow and black beans, but no amount of artificial culture or outside conditions would change a whole crop of yellow beans into black beans. In producing a black bean there would be no intermediate grades or shades of color. All at once, and without any expectation perhaps, the cultivator finds a plant among his white ones bearing black beans, and he sows them, and a black race of beans is the result. And what is true in this is really true of all races and forms of cultivated grains and vegetables. That change to some extent can occur by outward agencies has been shown in the cases of so-called pedigree seeds. In the case of wheat Mr. Hallet has introduced very good varieties by selecting the best seeds for several generations, and possibly every farmer knows that poor seed wheat will yield poor returns. Some actual experiments in this latter line have, however, been made at the Government Agricultural Experiment Station of North Dakota, and in a recent publication illustrations have been given on products of wheat from seeds treated under different conditions. Poor seeds resulted in poor crops. In this connection much interest has been attached to some experiments made nearly half a century ago by a French observer named Fabvre, who believed that wheat was developed from a species of grass called Aegilops ovata. He is reported to have selected at every generation those specimens that were more nearly in the line of wheat, and that he eventually succeeded in developing perfect wheat. It is but fair to say that there is no record of anyone having experimented with this same grass and with the results as Monsieur Fabvre claimed to have resulted. Wheat, rye, barley, oats and other cereals have been cultivated by many long before the historic age began, and though they have produced numerous variations, and are still varying, there has been really no evidence that any great change has ever occurred. The best rule for the cultivator is to carefully watch his crops and to note any one particular plant that may seem to have early seed, larger seed, or some other point which he is desirous of improvement, and then to take that particular plant for seed-bearing or propagating purposes, watching still among the progeny for some one individual that may come nearly up to his ideal. He may not know the law which underlies his change, or the power which directs this energy, but this is not material so long as we perfectly understand that these results follow in this way.

THE SOFT PHOSPHATE OF FLORIDA, ITS NATURE AND ITS AGRICULTURAL VALUE.

BY DR. WM. FREAR, *Chemist of the Board, State College, Penna.*

An unacidulated phosphate has recently been pushed vigorously upon the fertilizer market of this State under the name, "Natural Plant Food," about which many questions have been asked. It is really the material known to the fertilizer trade as the "Soft Phosphate of Florida." In view of the very high claims made for it by those offering it for sale, it may be of interest to briefly state what is known concerning it.

Hard, nodular lumps rich in phosphate of lime having been found in certain rivers of Florida, further search revealed that extensive deposits of pebbles of similar composition and of compacted, rock-like aggregations of such nodules existed at available depths in the banks contiguous. Later, it was observed that the more or less soft matrix in which the hard "rock phosphate" is imbedded, also possesses a high content in phosphoric acid. It has been offered upon the fertilizer market for four years past.

In a recet paper on "Florida Phosphates," (1) Peacock speaks of this material as follows: "Soft phosphate is found with both clay and sand soils as pockets and also as the matrix of other forms of phosphates. It closely resembles fine clay, being usually moist, compact and heavy. Its predominant color is white, but it shades through cream, yellow, gray and brown, and like all other phosphates, bleaches somewhat on exposure. The proportion of tricalcium phosphate contained varies widely, ranging from 40 to 80 per cent., the average being about 65 per cent. The combined oxids of iron and aluminum vary from 3 to 14 per cent. with an average of about 7. It is usually mined with pick and shovel much in the same manner as clay is worked up. The deposits generally run very even and yield enormously, the average yield per acre being placed at 5,000 tons. In the 'land pebble' field, the matrix is a soft, porous marl, impregnated with soft land pebbles in large quantities." The treatment subsequent is very simple: The soft, moist material is stored for ninety days under cover, ground fine and bagged for sale, having dried sufficiently without artificial heating.

As indicated above, the composition of this soft phosphate is subject to wide variations. Peacock cites the following detailed analysis:

	Per cent.
Moisture,	.20
Combined water,	1.75
Silicic acid,	26.90
Phosphoric acid,	29.49
(Equivalent to tri-calcium phosphate),	*64.38*
(Soluble in ammonium citrate),	*1.15*
Alumina and iron oxid,	2.75
Magnesia,	1.64
Alkaline chlorids,	.50
Carbonic acid, fluorin and loss,	2.49
Bicarbonate of soda,	1.19
Carbonated water,	1.21

But cases in which variations wider than those indicated by this writer have been observed in the course of experiment station investigations: Thus, a sample analyzed at the Rhode Island station, (2) contained 20.84 per cent. of alumina, 2.52 per cent. of iron oxid and scarcely any carbonate; a sample analyzed at the Florida station (3) showed 17.14 per cent. of alumina and 0.50 per cent. of iron oxid, with 2.50 per cent. of carbonate of lime; while an analysis made at the Alabama station (4) showed 32.39 per cent. of insoluble matter (sand,

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1. The American Fertilizer, I, 72-3.
2. Bulletin No. 13, p. 172.
3. Bulletin No. 13, p. 9.
4. Bulletin No. 48, p. 6.

etc.), and only 16.54 per cent. of phosphoric acid, of which only 0.32 per cent. was soluble in ammonium citrate, none being dissolved by water; a sample of ground raw South Carolina phosphate rock examined at the same time, showed 28.73 per cent of total phosphoric acid and 2.26 per cent. of available—though, of course, the South Carolina rock too shows considerable variation in its composition.

Not to burden the eye with too numerous figures, it may be permitted to cite the average of a large number of analyses of the several Florida hard phosphates used for the manufacture of super phosphates, of similar South Carolina phosphates, and of these soft phosphates, for the purpose of clearly establishing the general differences between the latter and the former. (5).

	Florida Rock Phosphate. Per Cent.	*South Carolina Rock Phosphate. Per Cent.*	*Florida Soft Phosphate. Per Cent.*
Phosphoric acid,..........	36.10	25-28	32.50
Iron and aluminum oxids,	4.80	1-6	8.70

In general, therefore, the soft phosphate is richer in phosphoric acid than South Carolina "floats," but it contains considerably more of the phosphates of iron and aluminum, and is therefore unfitted for acidulation; for, as has been explained in papers presented earlier to the Board, the phosphates of iron and aluminum require a disproportionately large amount of phosphoric acid for their acidulation, and the superphosphates even when most carefully made, are liable to extensive reversion of the soluble phosphates to insoluble forms. For these reasons, the soft phosphate is put upon the market in a finely ground, raw condition to be applied to the land without any further preliminary treatment.

In the circulars presenting the merits of this fertilizer, its richness in total phosphoric acid, as compared with that found in superphosphates, is especially dwelt upon; and it is even claimed that the acid in the dissolved rock is a positive source of injury to the soil. There is nothing in the composition of the acidulated phosphates likely to injure the soil chemically or in the matter of texture. There is, in properly manufactured acid phosphates, no free sulfuric acid, and the free phosphoric acid is only in small amount, and quickly combines with any oxid of iron or aluminum or with the lime of any calcium carbonate that may be present in the soil. The investigations of Whitney (6) show that the capillary behavior of solutions of acid phosphate is not very different from that of water; so that no change of texture of the soil by reason of any influence of this kind is to be expected.

However, a direct comparison of the effects upon crops by the two classes of phosphates affords the best answer to the questions arising in this connection. In studying the problem in this way it is to be recalled that the relative value of the new phosphate will differ according to the character of the soil to which it is applied, and to the nature of the plant used. There have, thus far, been few accurately made field tests with the Florida soft phosphate. There is no reason to believe, however, that it differs in its behavior in the soil, from other lime phosphates, rich in iron and aluminum. In a paper printed

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5. Miller's "Florida, South Carolina and Canadian Phosphates," pp. 91 and 135.
6. U. S. Weather Bureau, Bulletin No. 4.

in the report of the Board for 1890 (pp. 98-106), I have quite fully indicated the general results of comparative tests upon phosphates of this description. I wil not repeat here what was given there, but will note a few of the later studies upon the same point. In Bulletin No. 48, of the Alabama Agricultural Experiment Station, Dr. N. T. Lupton reports a field test made to determine the comparative productiveness of ground raw phosphate and acid phosphate under different conditions and to determine whether decomposing organic matter converts insoluble into soluble phosphate. For the former test two soils were used, (1) A strong red soil; (2) A poor sandy soil. The results were as follows—stated in pounds per acre:

Strong Red Land.

Plot.	Fertilizer.	Total phosphoric acid.	Available phosphoric acid.	Yield of seed cotton.
1,	Florida phosphate, 200 lbs.; cotton seed meal, 200 lbs., . . .	39.46	7.02	1,017
2,	Florida phosphate, 400 lbs.; cotton seed meal, 400 lbs., . . .	78.92	14.04	1,106
3,	Acid phosphate, 200 lbs.; cotton seed meal, 200 lbs., ...	35.10	30.46	845
4,	Acid phosphate, 400 lbs.; cotton seed meal, 400 lbs., ...	70.20	60.92	1,109
5,	Unfertilized, ...	. . . .	. . . .	863
6,	Florida phosphate, 200 lbs.; cotton seed, 400 lbs., ...	35.14	2.70	919
7,	Florida phosphate, 400 lbs.; cotton seed, 800 lbs., ...	70.28	5.40	1,182
8,	Acid phosphate, 200 lbs.; cotton seed, 400 lbs., ...	33.34	28.22	1,178
9,	Acid phosphate, 400 lbs.; cotton seed, 800 lbs., ...	75.68	56.40	1,387
10,	Unfertilized, ...	. . . .	. . . .	931
11,	Florida phosphate, 400 lbs., ...	66.16	1.28	898
12,	Acid phosphate, 400 lbs., ...	57.44	48.16	975
13,	Cotton seed meal, 400 lbs., ...	12.76	12.76	1,271
14,	Cotton seed, 800 lbs., ...	4.12	4.12	1,295

Poor Sandy Land.

Plot.	Fertilizer.	Total phosphoric acid.	Available phosphoric acid.	Yield of seed cotton.
1,	Florida phosphate, 400 lbs., ...	66.16	1.28	290
2,	Florida phosphate, 800 lbs., ...	132.32	2.56	220
3,	Acid phosphate, 400 lbs., ...	57.44	48.16	197
4,	Acid phosphate, 800 lbs., ...	114.88	96.32	144
5,	No fertilizer, ...	. . . .	. . . .	106
6,	Florida phosphate, 400 lbs.; cotton seed meal, 400 lbs., . . .	78.92	14.04	249
7,	Florida phosphate, 800 lbs.; cotton seed meal, 800 lbs., . . .	157.84	28.08	323
8,	Acid phosphate, 400 lbs.; cotton seed meal, 400 lbs., ...	70.20	60.92	252
9,	Acid phosphate, 800 lbs.; cotton seed meal, 800 lbs., ...	140.40	121.84	321
10,	Unfertilized, ...	. . . .	. . . .	234

The results here given are not by any means conclusive. The land was apparently not uniformly fertile. In the case of the red land, there seems to have been enough phosphoric acid already there for the uses of the cotton plant. In the case of the sandy land, there was lack of phosphoric acid, but the inequalities of the soil prohibit a closer generalization than that the two phosphates had approximately equal effects.

Eight mixtures of cotton seed or cotton seed meal, with Florida or South Carolina phosphates, subjected to fermentation, showed no regular increase of soluble phosphoric acid; the variations in the results are so lacking in uniformity as to suggest that inequality of the mixture was the principal source of variation, and that there was probably very little solution of phosphoric acid in the course of the fermentation.

The Connecticut Experiment Station (7) presents the results of a

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7. Annual Report, 1889, pp. 202-19.

number of field tests on different farms, with dissolved bone black as compared with the same money's worth of finely pulverized raw phosphates, of lime and of iron and aluminum: Grand Cayman phosphate, Thomas slag, and South Carolina rock. The results may be briefly expressed as follows in terms of total crop, excluding two cases in which lack of uniformity of the field was too great to permit the use of the yields thereon:

Unfertilized land,	100
Dissolved bone-black,	158
Grand Cayman's phosphate,	151
Thomas slag,	163
South Carolina rock,	141

Here again, the dissolved phosphate, though quicker in its action and therefore better fitted for trucking purposes, was not for the crop used in these experiments, corn, greatly superior, money-value for money-value, to the raw phosphates.

At the Pennsylvania Experiment Station (8) a test of water-soluble and reverted phosphoric acid, ground bone and South Carolina oats, carried on for six years, showed the following order of productiveness upon the calcareo-magnesian soil of that place: Bone, floats, reverted phosphate and soluble phosphate; i. e., the order of productiveness was inversely as the solubility; the absolute yields of total crop were respectively: 5,641 lbs., 4,092 lbs., 3,667 lbs., and 3,290 lbs. These figures are corrected for lack of uniformity in the original soil.

Pot experiments by F. W. Morse (9) made at the New Hampshire Experiment Station, to compare the several effects of dissolved boneblack, ground bone, basic slag ("Thomas slag"), redondite (a phosphate of iron and alumina), and "concentrated phosphate," made from the latter, gave as a result with a cereal crop, the following conclusion: "The results of the two years show that the concentrated iron and aluminum phosphate compared favorably with the ground bone and basic slag. The natural phosphate behaved unlike the concentrated phosphate made from it," giving a far inferior yield.

While the result of numerous field and pot tests made in Europe, indicate a very pronounced general superiority of water-soluble phosphoric acid over the insoluble, it is evident, nevertheless, that on many soils, especially when cropped with plants of long growing period, the raw phosphate is nearly, if not fully as useful as the dissolved phosphate. This is especially probable on soils rich in carbonate of lime or in the free oxids of iron or aluminum.

Be careful, however, not to pay too high a price for the material; assuming a percentage of 30 per cent. of phosphoric acid, at the selling price of $17 per ton, the price per pound of phosphoric acid would be 2.8 cents. The phosphate is so variable that it should be bought only upon a strict guarantee of its composition in the useful ingredient.

It is probable that different plants exercise quite different solvent powers over the phosphates present in the soil. Prof. B. Dyer, in a recent paper before the Chemical Society of London, showed that plant rootlets possess very different degrees of acidity in different species—

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8. Annual Report, 1889, pp. 159-161.
9. Agricultural Science, 7, 67-72.

a fact previously, but not so fully shown by other investigators. At the experimental farms connected with the national school of agriculture, at Grignon, France, it has been observed that oats can take up sufficient phosphoric acid for a luxuriant growth from a soil rich in iron phosphate, while wheat will starve alongside.

A very interesting study upon the capacities of plants in this particular has been made by the late Prof. Walten Balentine, at the Maine Station. (10). The plan involved the comparison of the several effects of nitrate of soda and muriate of potash applied alone, applied with raw ground South Carolina rock, and applied with an equal quantity of phosphoric acid in dissolved South Carolina rock. The test was made in triplicate with each of the following plants: Wheat, barley, corn, beans, peas, potatoes and turnips. In conclusion the author says: "While it may not be desirable to draw definite conclusions from so small an amount of data as is furnished by the above described experiments, there are some points which under the conditions of these experiments the results appear to bring out sharply.

1st. Different crops showed a decided difference in their powers of obtaining phosphoric acid from crude, finely ground South Carolina rock. Wheat, barley, corn, peas and turnips apparently appropriated the insoluble phosphoric acid from this source with greater or less ease, while beans and potatoes derived no benefit from it.

2d. The greatest practical advantage derived from the use of fine-ground South Carolina rock was with the turnips. With this crop a larger weight of dry matter and also a larger weight of fresh roots was obtained with insoluble phosphoric acid from the finely ground South Carolina rock than with an equal amount of soluble phosphoric acid from acidulated South Carolina rock.

3d. The indications point to a profitable use of finely ground South Carolina rock as a manure for barley and peas as well as turnips.

4. The acidulated South Carolina rock in these experiments apparently depressed the yield of grain with barley while largely increasing the amount of straw. With wheat both grain and straw were largely increased and in about the same proportion.

REPORT OF THE VETERINARY SURGEON.

BY DR. F. BRIDGE, *Veterinary Surgeon of the Board, Philadelphia, Pa.*

I have the honor to herewith present my report of a portion of the work accomplished, under provisions of the Act of May 9th, 1889, for the year ending November 1st, 1894.

It affords me pleasure to be able to again report that no case of contagious pleuro-pneumonia has been found within the State during the year, and, in fact, not for a number of years past; several suspicious cases have been reported by local veterinary surgeons, but a careful examination has clearly shown that they were cases of tuber-

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10. Annual Report for 1893, Part II, pp. 13-25.

culosis or other lung diseases. Our freedom from this disease is due to the prompt action of your Board, with the co-operation of the National Bureau of Animal Diseases, and inasmuch as the latter department, through the National Commissioner of Agriculture, has declared the country free from this disease, it is hoped that we may not have to again report its outbreak.

Early in November, 1893, a serious outbreak of glanders was reported at Wilkes-Barre, but owing to the active co-operation of Dr. Leonard Pearson, of Philadelphia, and the local veterinarians, assited by the Sanitary Committee of Wilkes-Barre City Council, the disease was practically confined to the two stables in which it originated, The animals, in both stables, were twice tested with mallein, and all which gave the characteristic rise in temperature indicating infection, were killed and promptly paid for by your Secretary. When the number of animals exposed to the infection, and the character of the service which they were compelled to perform, is taken into consideration, we have causes to congratulate the owners that no greater amount of loss was experienced.

When the stables were first visited, they were found to be under the case of the sanitary committee of the city council, and your Secretary did not deem it wise to change the administration of affairs, but merely confined my duty to inspecting and verifying the condemnation of animals previous to paying for them. Our thanks are especially due to Drs. Pearson, Walter and Timberman for their active, efficient and practical co-operation, by which the expense to the State was greatly decreased without in any manner impairing the efficiency of the work.

All cases of glanders which have been, from time to time, reported have been carefully investigated, and all animals found to be infected have been promptly condemned under the provisions of the Act of May 9th, 1889, and paid for by the Secretary of your Board, in all cases, to the entire satisfaction of the owners; and the amount thus saved to the live stock owners of our State has been large, and many times the cost of the work performed.

During the past year but three outbreaks of Texan fever have been reported, all of slight extent, and in each case they were placed under the charge of the local veterinarian, who, acted under the instructions of the officers of your Board, and in two cases with the co-operation of members of your Board; in all three cases, but recently purchased Western cattle or those already on the farm, were affected, and so far as known, no outbreak was due to the actual importation of Southern, infected animals. This condition of affairs is no doubt largely due to the inspection of Southern animals at the leading shipping points in the West, by veterinarians in the employ of the United States Bureau of Animal Industry, and also to the prohibition of the shipment of Southern animals, except during certain months in the year.

Several outbreaks of anthrax have been reported, and when the character of the weather during the latter portion of July and all through August is taken into consideration, it is surprising that more cases of this disease were not recorded. The water supply, in many pastures, was either dried up or so much reduced in amount as to become stagnant, and as it in this condition carries with it a train of circumstances peculiarly adapted to increasing the anthrax germs, we may be thankful that greater losses were not experienced.

One of the outbreaks, near Tyrone, was the greatest in extent that has come under our notice since the formation of your Board, and one near Beech Creek was, though worse in some respects, confined to a smaller number of animals, with a less total loss by death. The outbreak near Beech Creek was carefully examined by Dr. Leonard Pearson of Philadelphia, and the one at Tyrone by your Secretary and myself.

That near Tyrone involved 196 head of animals, pasturing a rough, mountain enclosure of 1,600 acres; previous to our receiving notice of the outbreak, a large number of animals had died, and at the time of my visit, their carcasses were contaminating the air and water supply in various parts of the enclosure. The pond near the centre of the enclosure had, for want of rain, been reduced to a mere mud-hole of warm, stagnant water, and taken as a whole, we could probably not have devised a series of surroundings more favorable to the rapid increase and spread of the germs of the disease; for while it is true that in the absence of the disease germs, no amount of violation of sanitary laws can create the disease, yet, with unfavorable surroundings, the rapidity of the spread, and the losses by death, are greatly increased.

Immediately after my visit, all animals not showing the symptoms of the disease were removed to other pastures, and but two died after removal, and these were in reality so much infected at the time of removal that no amount of treatment nor satisfactory sanitary surroundings could have saved them.

Some of the putrid carcasses were found lying close to the stream, then nearly dry, which supplies a portion of the city of Tyrone with water. The attention of the local authorities was called to the danger of contaminating the water supply, and through this, the possibility of causing disease and loss of life to the citizens of Tyrone; acting upon the advice of Secretary Edge and myself, all carcasses sufficiently near the stream to endanger the water supply, were thoroughly burned with coal oil and dry wood, and it is gratifying to be able to report that, although rain followed soon after, no sickness was caused in Tyrone.

The usual number of outbreaks of Hog Cholera have been reported, but inasmuch as the Governor and Secretary of your Board have not recognized this disease as coming under the provisions of the Act of 1889, our work was confined to giving advice to the owners and local surgeons as to treatment for the prevention of further losses. It is gratifying to know that in this respect the advice followed resulted in saving the lives of a large number of animals.

During the year, 83 herds of cattle, containing 1,464 animals, have been examined for tuberculosis; a large proportion of these have been tested with tuberculin, and in all cases all animals found to be infected have been condemned, killed and paid for under the provisions of the act of 1889.

The Philadelphia Board of Health, being anxious to protect the city milk supply requested the co-operation of the Secretary and surgeon of your Board for an examination of herds in the suspected districts laying within the city limits; in connection with Dr. G. R. Hartman, the veterinary surgeon of the Board of Health, I carefully examined a large number of herds. Where there was a reasonable suspicion that tuberculosis existed, a tuberculin test was made, and all condemned animals killed. It is somewhat remarkable that, notwithstanding the reported prevalence of the disease in the district northwest of the city proper, it is a fact that out of 590 animals examined, but nine were found to be diseased. This was probably due to the fact that the animals were allowed to run at large upon the commons during a large portion of the year, and that during the remainder of the season, they were confined in stables more or less open, thus securing throughout the year a plentiful supply of fresh air and sufficient exercise to develop and maintain that condition of the system which would enable them to throw off disease of any kind, and to prevent the permanent lodgment of the germs of tuberculosis or other diseases in their systems; for while no amount of bad ventilation, bad feeding, want of care or other abuse, can create tuberculosis, yet it is a fact which cannot be controverted that it is essentially a disease of animals highly fed, kept in tight and warm stables, and possibly for several generations bred with a special view to the production of milk or butter.

A number of herds have been tested with tuberculin, and thus far we have found no cases of the characteristic rise of temperature under this test which have not been found to have tubercles in some portion of the body, varying from a few in the mediastinal gland to general tuberculosis of the lungs or intestines.

In order to answer the many queries which have from time to time reached me, and which, since the Philadelphia Board of Health has demanded a certificate of the tuberculin test from each herd furnishing milk to the city, have increased greatly in number, I give the following condensed method of making this test, which in the future will no doubt exercise an important part in the attempts which will no doubt be made to confine the disease to much smaller limits.

On the day appointed for the test, the animals should not go out of the stables, except for water; the stable should not be kept close or warm. About noon, take the normal temperature of each animal and continue so doing every two hours until 10 o'clock; I then make the tuberculin injection, using either Koch's lymph or that prepared by the United States Bureau of Animal Industry. If the Koch lymph is used, it should be prepared by mixing a one per cent. solution of carbolic acid in distilled water and adding ten per cent. of the tuberculin. I usually inject 0.5 to 0.35 c. c of the ten per cent. mixture, varying the amount with the size and condition of the animal.

If the tuberculin prepared by the Bureau of Animal Industry is used, it is already diluted and the proper amount, 2 c. c, or about 30 drops for a full-sized animal; the amount to be decreased with the size and age of the animal on which it is to be used.

Animals in heat, or near parturition, or sick from any causes, should not be injected, as the rise of temperature, if any takes place will not necssarily be indicative of tuberculosis. All possible care should be taken to guard against errors which may arise from these or other causes.

When a large herd is to be tested, I have two syringes, one of which is being filled by my assistant while the other is being used;

but with small herds, the assistant holds the supply of tuberculin, taking care to protect it as much as possible from the entry of disease germs from the air. In making the injection, I dip the point of the needle of the syringe in cosmoline which as been prepared by the admixture of five per cent. of creoline; this will disinfect the needle and lessen the pain at the point of puncture. Entering the stall at the right side of the animal, I place my left arm over the neck, pinch up the skin in front of the shoulder or along that portion of the neck where the skin is found to be the thinnest. Holding the syringe in the right hand, I insert the needle and make the injection.

I would commence taking temperatures about nine hours after the injection and take them every two hours until I was satisfied from the temperature table that no further rise of temperature need be expected.

The following table, from my note book, showing the result of the use of tuberculin in a herd of 15 cows near the town of Washington, Pennsylvania, will illustrate the result of the injection in both healthy and diseased cows.

Cows No.	Temperature 6 hours before injection.	Temperature 4 hours before injection.	Temperature at time of injection.	Temperature 9 hours after injection.	Temperature 11 hours after injection.	Temperature 13 hours after injection.	Temperature 15 hours after injection.	Remarks.
1, ...	103.2	103	103.2	102	103	103	103	Not destroyed.
2, ...	103.2	102.2	102.2	104	106	106	105	Mediastinal glands and both lungs affected.
3, ...	102	101.2	101.1	101.3	101.2	102	102	Not destroyed.
4, ...	101.4	102	102	103	105	105	105	Abscess in both lungs; tuberculosis in liver.
5, ...	103.1	103.2	103	104	106	105	104	Both lungs and mediastinal glands badly affected.
6, ...	103	100.1	101	103 2	105.2	105.2	105	Both lungs affected.
7, ...	102.3	103	102	103	105	106	106	Both lungs, diaphram and intestines affected.
8, ...	102.3	103	102.1	105.2	106 2	105.1	105	Right lung inguinal glands affected.
9, ...	103	101.2	102	107	107	107	106.2	Lungs and mediastinal affected.
10, ...	102	101 2	101.3	102	105	106.1	106	Both lungs affected; an abscess in same.
11, ...	103	102.2	102.2	102.1	104	105.2	104	Mediastinal glands affected.
12, ...	102	102.4	102.2	103.1	103	102.2	102	Not destroyed.
13, ...	102.2	101.1	101.4	102	102	102	102	Not destroyed.
14, ...	102	102.2	102	105	106	105.1	105.2	Killed.
15, ...	102	102	101.4	102	102	101.3	101.4	Not destroyed.

In this herd, which had been badly infected for a number of years, and in which one or more animals had been lost each year without any suspicion of the nature of the disease until it was pointed out by Dr. C. S. McKenna, ten animals were condemned and killed, showing as the post mortems indicated in the table; the other five were not affected. The table of temperatures given above very nicely shows the increase which took place under the action of the tuberculin.

In addition to herds examined for tuberculosis, others have been examined for other diseases, and, in all cases attention has been given to all reported herds, either in person or by mail, or by the local veterinary surgeon acting on advice furnished either by your Secretary or by myself, and the amount of benefit thus received by the stock owners of our State has been very great, in comparison with the amount of funds appropriated for the purpose.

Under the Act of May 9th, 1889, the amount to be paid for animals condemned is limited to $2,500 in one year, and the amount available for the veterinarian's services and expenses is limited to $1,000 per year—amounts which are entirely inadequate for the duties assigned by the act.

In former years, when tuberculosis was not included in the list of diseases to which the provisions of the act were extended, these amounts more nearly covered the expenses, but even then, we were unable to give proper attention to all cases reported, because it was known that the amounts available would be exhausted before the end of the year.

Since tuberculosis has been included and our larger cities demand protection from the State for their milk supplies, it is imperative that the Legislature should grant your Board a greater amount of funds with which to prosecute the work enjoined by the act alluded to.

The following tables show the work accomplished in relation to tuberculosis and glanders:

Horses Examined for Glanders from November 1, 1893, to November 1, 1894.

Date of examination.	Where Located.	Number of horses examined.	Number of horses destroyed on account of glanders.
Nov. 8, 9,	Luzerne county,	54	9
Nov. 13 14,	Luzerne county,	31	4
Nov. 25, 26,	Luzerne county,	20	4
December 1,	Philadelphia,	6	1
December 7,	Philadelphia,	2	1
Dec. 9, 11,	Philadelphia,	44	1
Dec. 19, 20,	Luzerne county,	10	1
February 26,	Philadelphia,	10	2
March 19, 20.	Luzerne county,	16	1
March 28, 29,	Luzerne county,	23	.....
April 5,	Berks county,	4	1
June 3, 4,	Luzerne county,	18	2
June 21,	Montgomery county,	1	.....
July 12, 13,	Tyrone,	12	.....
July 19, 20,	Luzerne county,	26	1
August 6,	Lancaster county,	3	1
September 28,	Lancaster county,	6	2
September 29,	Philadelphia,	1	1
October 8,	Philadelphia,	1	1
	Total,	288	33

Herds Examined for Tuberculosis, from November 1, 1893, to November 1, 1894.

Date of examination.	Location of Herd.	Number of herds examined.	Number of cattle examined.	Number of animals destroyed on account of tuberculosis.
1893.				
November 7,	Lebanon,	2	98	3
November 24,	Philadelphia,	1	76	5
Dec. 21, 22,	Washington,	1	15	10
1894.				
January 1, 2,	Philadelphia,	4	60	2
January 11,	Delaware county,	1	17	1
February 6,	Chester county,	1	24	10
Feb 8, 9, 10,	Wayne county,	3	141	4
February 22,	Chester county,	1	16	2
February 28,	Bucks county,	1	18	7
March 30, 31,	Bucks county,	1	6	4
May 23,	Lebanon county,	1	10	5
May and June,	Montgomery county,	1	199	184
July 4,	Bucks county,	1	10	.....
July 14,	Pottstown,	1	17	2
July 25, 26,	Juniata county,	2	28	2
August 1,	Montgomery county,	1	17	1
August 1,	Montgomery county,	1	13	1
August 1,	Montgomery county,	1	22	.....
August 3,	Montgomery county,	1	13	1
August 3,	Montgomery county,	1	11	.....
August 3,	Montgomery county,	1	14	.....
August 31,	Philadelphia,	1	34	1
September 1,	Philadelphia,	1	27	1
September 1,	Philadelphia,	1	32	.....
September 5,	Philadelphia,	1	33	.....
September 10,	Philadelphia,	1	11	.....
September 10,	Philadelphia,	1	14	.....
September 10,	Philadelphia,	1	6	.....
Sept. 11, 12,	Montgomery,	1	46	.....
September 26,	Philadelphia,	1	9	.....
September 26,	Philadelphia,	1	17	.....
September 27,	Philadelphia,	1	21	.....
September 27,	Philadelphia,	1	9	.....
September 27,	Philadelphia,	1	14	.....
September 27,	Philadelphia,	1	8	.....
September 27,	Philadelphia,	1	2	.....
September 27,	Philadelphia,	1	1	.....
September 27,	Philadelphia,	1	5	.....
September 27,	Philadelphia,	1	11	.....
September 30,	Northampton county,	1	10	1
October 1, 2,	Philadelphia,	1	10	.....
October 1, 2,	Philadelphia,	1	22	1
October 1, 2,	Philadelphia,	1	5	.....
October 1, 2,	Philadelphia,	1	28	.....
October 1, 2,	Philadelphia,	1	19	.....
October 1, 2,	Philadelphia,	1	8	.....
October 1, 2,	Philadelphia,	1	8	.....
October 1, 2,	Philadelphia,	1	2	.....
October 1, 2,	Philadelphia,	1	9	.....
October 3,	Philadelphia,	1	6	.....
October 3,	Philadelphia,	1	2	1
October 3,	Philadelphia,	1	4	.....
October 3,	Philadelphia,	1	4	.....
October 8,	Philadelphia,	1	22	.....
October 8,	Philadelphia,	1	19	.....
October 8,	Philadelphia,	1	28	.....
October 15,	Philadelphia,	1	25	.....
October 15,	Philadelphia,	1	20	.....
October 15,	Philadelphia,	1	18	.....
October 15,	Montgomery,	1	9	.....
	Total,	83	1,464	190

THE WATER SUPPLY FOR FARMS.

BY DR. GEORGE G. GROFF, *Sanitarian of the Board, Lewisburg, Pa.*

There is no more important matter in the hygiene of the farm than the water supply. A good water should be soft and not hard. Hard waters are much less valuable for cooking foods than waters which are soft, and not nearly so valuable for washing as soft waters. Hardness in water is due ordinarily to the presence of the salts of calcium or magnesium, and if the water is very hard, it is commonly believed to be somewhat injurious to health when used for drinking. Water for drinking should not only be soft, but also clear and as free as possible from organic matter. The water from a surface well will, at a new farm or at a new building, be almost always pure. But after a time, when the soil becomes saturated with waste material from house and barn, the waters of the well are almost sure to become contaminated; and the same is true, although to a less degree, with the waters of springs. It is now well known to physicians that a number of the more serious diseases to which the human family is subject may be spread through communities by the drinking of contaminated water. Thus, it is almost positively demonstrated that typhoid fever spreads in this way, the water being contaminated with the excreta from patients suffering from this disease. Diphtheria may possibly be spread in the same way, as also is cholera and possibly, yellow fever. It hence follows that water of a good quality is very important for drinking purposes.

The sources from which waters are commonly drawn on farms are the well, the spring and the cistern. Wells may be divided into shallow and deep. The shallow wells receive their supply from the rainfall in the immediate vicinity of the well, and are almost sure to become contaminated in the course of a few years, unless great care is taken to keep all the surroundings in a cleanly condition. Deep wells may be considered to be those which reach to such a depth as to tap waters which may come from a region outside of their immediate vicinity. Some deep wells reach underground streams, but this occurrence is not common, although very deep wells may be supplied with water which has percolated through the rocks for a great distance. Other things being equal, we would always except the water from a deep well to be purer than that from a shallow or surface well.

In this connection, it may be well to call attention to so-called "artesian" wells, which, in recent years, have been somewhat extensively bored in different parts of the State. An artesian well is commonly thought to necessarily furnish pure water because of the great depth from which the water is supposed to be obtained, the ground traversed by the descending streams having thoroughly removed all impurities received at the surface. But a shallow bored well is not an artesian well; and bored wells, called "artesian wells," less than 100 feet deep, or in some towns and villages possibly exceeding 100 feet in depth, do not necessarily furnish pure water supplies. In some villages in Pennsylvania, each house receives its water supply from a so-called artesian well, which in reality is only a shallow or surface bored well. In these same towns and villages, the houses are supplied with modern conveniences, that is, bath tub, water closet, etc., and all the waste water from these, as well as from the kitchen, is discharged into a surface well, and it is not an uncommon thing at all, in such communities, to find the cesspool and the well in close proximity to each other, so that it is almost certain that in a very short time a connection will be established between the two, and indeed, the well may be largely supplied from the cesspool. It is clear that such conditions cannot continue long without being detrimental to the health of those who use such water.

In guarding the water in a well, it would be proper to bear in mind that in some locations, the well could be protected better than in others. Thus, the location should always be distant from the barn yard, from pigpens and from the family cesspool or privy. Attention should always be paid to the slope of the ground and rocks. Oftentimes one can tell the direction of the underground drainage by a little observation upon the slopes of rocks and soils. The writer has often observed wells which almost certainly received drainage from the barn yard, the pig pens and even from privy vaults. All such matters reaching the well waters would injure it for domestic purposes. But, it is well to bear in mind always that the waste matter which is most injurious to any animal in that which comes from its own body, and hence the drainage into the well from the privy vaults would produce much more serious results to the family than the matter which drained from the barn yard or the pig pen. Typhoid fever, for instance, could probably never come from any matter that would be found in the barn yard or the pig sty, but it would almost certainly reach the well in the drainage which came from the privy vault. Books sometimes make the statement that the vault should never be nearer than 100 feet from a well, but the great matter is to get it as far from the well as possible. Indeed, on village and town lots and about farm buildings, it is seldom as far as it ought to be from the well. The danger from this source is so great that the vault should be abolished from our homes, and some other method of disposing of this waste be provided for. The writer believes that this can be done conveniently and economically with the different forms of earth closet.

Well waters are also frequently impaired by small animals falling or crawling into the same and there perishing, such as mice, rats, frogs, toads, earthworms, etc. This annoyance can ordinarily be prevented by making a tight wall to a depth of four or five feet from the surface and covering this with a tight curb; or, a better plan still, is one which has recently come into use, that of placing a terra cotta pipe in the well, in which pipe the pump stock is placed. Then outside the terra cotta pipe, reserving a proper chamber for the water, the well is filled in with stone and earth. This plan almost certainly excludes all ordinary surface contamination.

It is proper to bear in mind that the water in the bottom of a well is not circulating, and whenever contaminated the contamination remains until the water in the well is exhausted. When waters are high, the contaminating substances are much diluted. When the waters are low, the dilution is slight. Hence, we always find the greatest trouble with well waters when they are low. Sickness on farms is most common in that portion of the year—the late summer and early autumn, when waters are unusually low, and if it is suspected that there are contaminating influences present, special attention should be given to the waters at this season of the year.

The second source of water supply named for the farms is the spring. Years ago, in the neighborhood of Philadelphia, a good spring was considered as adding very much to the value of a farm. The writer has frequently heard farmers place an estimate of $1,000 on each spring. Spring water has this advantage over well water, that it is continually flowing, and hence if contaminated, in running a short time the substance which has produced the contamination is carried off, and the water becomes pure, while in the case of the well, the foreign matter remains there until all pumped out; in the spring it runs out. Spring waters, like well waters, may be hard or soft. In limestone regions, spring water is commonly hard; in sandstone regions, soft. Another advantage which the spring has as a source of water supply on the farm is that it may be frequently conducted in pipes to the buildings as running water. Wherever tihs is possible, such a supply should be secured.

The last source of supply is the cistern. And this is coming into use more and more as years pass. A few words on the collection and preservation of rain water may be of value. It is not possible to collect the best article of rain water except from slate roofs. Shingle roofs furnish such a large amount of wood fibres as to seriously contaminate the water. Where it is decided to build cisterns for furnishing a supply of water for domestic purposes, slate roofs should be placed upon the building. In filling the cistern, it is well always to bear in mind that the troughs on the roof collect dust and leaves and other waste matters carried there by winds, so that the pipes leading to the cistern should always be so arranged that the water may discharge into the cistern or on the outside. The pipes should be so set that on sudden showers coming up, the water will always discharge outward, that is, from the cistern; and water should be turned into the cistern only after roofs and troughs have been thoroughly washed by the rain.

If the cistern is large enough, so that the collections can be made in the winter time, a better quality of water will be secured than if collected in the dry and hot seasons of the year, for the reasons that the rains wash the atmosphere of its impurities, and the air is purer in the winter than in the summer, and hence, supplies collected in the winter are purer than those collected in the summer.

As the water enters the cistern from the roof, it should always be filtered to remove whatever accidental impurities there may be in it. A small filter of the size of a barrel, the lower part filled with sand and charcoal through which all the water should pass before entering the cistern, will do this work quite nicely. It is a common custom to build cisterns in two compartments, the partition wall being constructed of brick laid in cement, the pump placed in one compartment, the water entering the other, and as the water flows out of one side through the pump it flows through the brick wall into the other and is thus filtered. This answers quite well, but there is this objection:

that unless the water is filtered before entering the cistern, we have water on one side containing contaminating matter, separated from the other only by a thickness of two or three inches of brick. It is much better to keep out of the cistern all of the impurities that we can. If rain water is collected carefully in this way, there is no trouble at all in keeping it wholesome so that it may be used during the whole year. And if the cistern is located in the earth at sufficient depth, the water will keep cool and cannot ordinarily be distinguished by any taste from well waters.

In conclusion, a means of purifying water which may be contaminated, and which, there being no other supply for domestic purposes, it may be necessary to use, will be given. Any water may be made suitable, ordinarily, for domestic purposes by boiling. This will destroy anything which might be contained that would be injurious to the human family. The water should be boiled at least one-half hour and afterwards cooled. Filtering contaminated waters will remove many impurities, also, but filtering is not considered as thoroughly reliable a means for purification as is boiling. There is this objection to the use of the filter, that if the water is very impure, in a short time the filter becomes filled with impurities and then fails to do its work. In the hands of careless people, the filter may do more harm than it does good. But, if a filter is carefully washed and cleansed at frequent intervals, it may do much in removing impurities from the water. Where well water is the source of supply, it is proper always, whenever it is suspected to be impure, to boil it, and the same may be said in any case where the supply is from a river or other stream. In the later summer and autumn, such water is always best prepared for domestic use by first boiling.

REPORT OF THE FOOD INSPECTOR AND MICROSCOPIST.

BY DR. HENRY LEFFMANN, *Inspector and Microscopist of the Board, Philadelphia.*

During the past year my attention has been largely directed to the special topics, food colors and food preservatives. Recently I summarized some of the results in an article in the Dietetic and Hygienic Gazette substantially as follows:

The artificial coloring of food has been practiced for a long period, and it is probable that in much earlier times when the effects of mineral colors were almost unknown and the supervision of the composition of food far less developed than at present, the damage done to health by the reckless use of colors was very great. The constant attacks made by sanitary authorities on the use of mineral substances in food have tended to decrease the use of them and it is comparatively rarely that we find arsenic, copper or lead colors in food. Among the substances long used and commonly regarded as harmless are the vegetable colors, indigo, turmeric, annatto, and logwood, and the animal color, cochineal. While there is but little positive physiologic or clinic evidence to show that the continued use of these bodies in small amounts is harmless, yet it seems to be generally held that they may be employed provided the object is not to conceal inferiority or adulteration.

Almost all the old methods have, however, been overthrown by the remarkable progress in the production of artificial colors, whose name is legion, for they are many.

Of these colors it may be said that, fortunately, they appear to be without appreciable toxic qualities, except, perhaps, in large and repeated doses. Their distinct character, especially their high tinctorial power precludes the possibility of their being taken by mistake and they are not likely to have cumulative power. An incidental danger from their use arises from the presence of poisonous mineral matters, either accidentally introduced in the manufacture or purposely added in order to enhance the brilliancy or permanence of the article.

In the practice of using colors to conceal the nature or quality of goods, the wholesomeness of the color is but a part of the question. Among the foods largely colored with a view to enhance their salability are milk and milk products. The community-at-large tends to regard a rich yellow tint as evidence of good quality in these articles and dealers are not slow to take advantage of such opinions. A color long used by dairymen and milk purveyors is annatto. I think the consensus of opinion is that this is not injurious. It is said that some specimens of annatto are prepared by fermenting with urine, but this is doubtful and there are certainly brands which are free from this taint. It is a vegetable color of considerable tinctorial power. Associated with tumeric it is now found in several prepared "butter," "milk," and "cheese" colors. The solution is usually obtained by the use of some fixed oil (cotton or olive), or if it be desired to have a watery solution, by the use of sodium carbonate. The oily liquids are added especially for use with butter and cheese, the watery solution are suitable for milk as well. I have experimented with about half a dozen of the commercial preparations. The mixture of colors employed renders the analyses uncertain, but it is evident that, as noted above, annatto and turmeric are the favorite ingredients. Methyl orange is, however, also used. The following formulae taken from a recent issue of the Druggists' Circular, give a good idea of the nature of these preparations:

Annatto seed, bruised,	10
Turmeric,	3
Ammonium carbonate,	1
Cottonseed oil,	75
Lard,	10

Extract of annatto,	10 ozs.
Tumeric,	5 ozs.
Logwood chips,	2½ ozs.
Cotton oil,	1 gal.

Concerning food preservatives, we find almost as great a lack of facts as with colors. We have not so large a list to consider, because although many preservative bodies are known, some are too costly or too characteristic in color, taste or smell and others are so well known as dangerous that the most unscrupulous persons would not use them. Among the preservatives which are available for addition to food we find common salt, potassium nitrate (niter) various sulfites, salicylic acid, benzoic acid, sodium benzoate, boric acid, borax and baking soda salt and niter are used for meats, but it will not be necessary to discuss them here. Salicylic acid and borax have been of late years widely used, especially for fermentable articles, such as beer, milk and preserved fruits. Sodium benzoate has also a fair use. These articles are sold under various names, such as "preservaline," "conservaline," "rex magnus," which give no clue to the nature of the body. I examined lately a series of five of these preparations put up by the same firm. A preservative for cider was found to be salicylic acid; a preservative for meat and milk was found to be borax. Another sample contained salt and baking soda. The preparations were highly recommended as harmless and efficient and sold, of course, at higher prices than they could be obtained for under their proper names. I know from conversation with dairymen that a milk preservative consisting of borax is largely used to keep milk without the aid of ice.

We must decide, I think, against the general use of food preservatives for the following reasons:

We have no knowledge as to the effect of the long continued use of small doses, and it is an unwarrantable assumption that because we have not observed harm it does not occur.

Processes of digestion are allied to processes of decomposition in so far that the latter are frequently preceded by transformations under the influence of ferments. We may infer, therefore, that whatever prevents putrefaction must, at least, delay digestion. This, as noted above, has been actually shown with regard to some preservatives.

In many forms of food the use of preservatives will encourage negligence in the processes of manufacture or permit the use of inferior or slightly decomposed materials.

The methods of preservation are not wholly understood, and there is a great temptation to use a large amount of the preservative to insure success.

As long as the sale of such articles, under proprietary names, continues there is no guarantee as to what may be used. A dealer may to-day sell salicylic acid under the title "antispoil," and to-morrow may substitute some even more dangerous body, if it be cheaper and, at least, equally efficient.

An interesting question is as to the effect of food adulteration in the poorer classes, especially of our larger cities. There is not much literature on the subject, but I think that the manner in which food adulteration effects the dependent classes is, well shown by the history of oleomargarine. I have been familiar with the status of this article, in Pennsylvania, at least, for ten years. It is my opinion, formed after the most careful, thought I have been able to give, that the manufacture of oleomargarine is one of the humbugs of the century. Defended by numerous experts as a "cheap, wholesome, and nutritious substitute for butter," it is found on close study to surely not deserve the first enconium and possibly neither of the others. Its standing with the more intelligent part of the community is based on the supposition that it affords a cheap food to the masses. Well-to-do merchants, lawyers, doctors, etc., do not desire to eat oleomargarine; they prefer butter, but they think that since economy is important in the lower strata of society, this substitute article enables a saving. As a matter of fact, no poor man or woman gets the benefit of the cheapnes of oleomargarine. It brings butter prices at all points at which it meets the consumer. Thousands of samples have been submitted to me, and for all purchased at retail in small lots, butter prices were paid. It is a characteristic of all forms of adulteration that there is no assignable limit to its extent. Some slight modification of the nature of a food article is brought to public notice, and seeming to be of little significance, is allowed to pass unchecked. A foothold thus gained, the adulterators find some advantage in a little further modification, and so by easy steps a complete substitution may be accomplished. This principle is well illustrated in the case of oleomargarine. At first made from selected fats and colored with annatto and turmeric, which have long been used in the dairy, it is now colored by coal-tar products concerning the wholesomeness of which we are ignorant, and according to recent analyses, samples have been found to contain paraffin an entirely indigestible article.

What we consider, therefore, the known inferiority in nutritive value, of this substitute to butter itself, together with the dangerous admixtures to which it is subject, and further consider the extensive sale of it, especially among the poorer and badly nourished class, we must believe that it must contribute to preventing proper growth and development in the young.

A substance called Paskola has been lately placed upon the market with extravagant claims as to its nutritive and digestive value. At the request of the editor of "The Dietetic and Hygienic Gazette," I made some investigations into the nature and effects of this article with the result that it is of about the composition of commercial glucose syrup, which usually contains about equal quantities of dextrose and dextrin. There is a small amount of hydrochloric acid and a trace of sulfurous acid. I was unable to obtain any digestion actions with it. Solution of starch is not converted, nor is either coagulated or uncoagulated white of egg altered. It must, therefore, have very little usefulnes as a food article or assistance to digestion.

The subject of the regulation of milk supply continues to engage great attention, but has developed in the past year no specially new features. It is, in my opinion, beginning to be more and more plain that mere analytical control is of very little importance. What is needed is dairy inspection so as to prevent the milk of diseased cattle being sent into market and also to secure the elimination of all danger from illness among the persons employed on the dairy farm. Whether milk contains 2, 5 or 3 per cent. of fat, or 7 or 9 per cent. of solids not fat is a minor matter.

I have made some analyses of condensed milks and have found none which are made from skimmed milk, at least not from closely-skimmed milks. In England several brands are known which contain very little fat, but all the samples I have obtained in this city have contained a fair amount of fat. The brands called "evaporated cream" are in some respects to be preferred as a diet for children, because the other brands known as "condensed milks" usually contain much cane-sugar. The evaporated creams have however, a somewhat disagreeable burnt taste.

Oleomargarine analyses for the Dairy and Food Commissioner have constituted a considerable bulk of the analytical work on food during the year and in that I have encountered very little new. Very few mixtures of oleomargarine and butter are in the market. Methyl-orange, or at least, a coal-tar color nearly the same is largely used in the coloring of commercial samples. The details of this and allied matters will be fully set forth in my report to the Commissioners. I have also set forth my views on the milk-question in a separate paper, which will appear in the report of the Board.

SEWAGE POLLUTED STREAMS.

By Prof. C. B. COCHRAN, *Microscopist of the Board, West Chester, Pa.*

In this article an attempt has been made to study the changes that take place by flow and dilution in the waters of two small streams both of which are loaded with sewage. It has been my desire to see how far this pollution could be distinctly traced by the ordinary methods of Chemical Analysis; and to better inform myself in regard to the character of water supplied to pastured cattle, for both of these streams flow through pasture lots and become the water supply for milch cows.

One of these streams has its origin in the borough of West Chester. It receives the refuse of one creamery, teh drainage from a large slaughter-house, anud one large sewer which carries off the waste from a considerable portion of the town. About a mile outside of the town it is joined by another stream rather larger than itself. From this junction it flows in a westerly direction for a little more than one mile where it empties into the East branch of the Brandywine.

The other stream, called the West branch of Chester Creek, arises from a few springs just outside the borough limits. It flows through the eastern part of the borough and receives a large part of the drainage of the town. About four miles southeast of the borough it joins with the East branch to form Chester Creek, which flows through a thickly populated agricultural or dairy district for a distance of eighteen or twenty miles. It then empties into the Delaware river at the city of Chester. This stream forms a water supply for cows even before it gets outside of the town.

In the analysis of water from these streams the following determinations have been made: Chlorine, nitrogen as nitrites, nitrogen as nitrates, nitrogen as ammonia, nitrogen by alkaline permanganate, also total solids, and loss on igniting. The results in all cases are expressed in parts per million.

Chlorine exists in minute quantities in the water of the purest springs and streams, derived from soluble chlorides existing in the soil or underlying rocks through which the water has passed. As chlorine is a constant constituent of animal matters and animal excreta, an excess of this element in a water above that natural to the locality, unless it can be otherwise explained, is an indication of animal contamination. Pollution by vegetable matter does not materially increase the amount of chlorine.

Nitrogen by Permanganate: A determination of the nitrogen obtainable by distilling with alkaline permanganate is one of the ways of judging of the amount of organic matter dissolved in a water. A high figure for the nitrogen by permanganate, accompanied by an excess of chlorine, is evidence of animal pollution.

Nitrogen by Ammonia: Compounds of ammonia are sometimes introduced directly into waters, as when a stream receives the refuse of a gas works; but ordinarily their presence is to be attributed either to the putrefaction of nitrogenous organic matter, or to the reduction of nitrites or nitrates. In either case their presence is a bad indication, as it shows that rapid decomposition or fermentation is taking place. In well aerated surface waters, such as we are now considering, ammonia would almost always result from the first named cause, i. e., the decomposition of nitrogenous organic matter.

Nitrogen as Nitrites: Nitrites are transition products between ammonium compounds and nitrates, and show an active fermentation due to the agency of microorganisms. The presence of nitrites in water is regarded by the majority of sanitary chemists as a very bad indication. Dr. H. Leffmann says, the presence of measurable quantities of nitrites in river or subsoil water is sufficient ground for condemnation.

Nitrogen as Nitrates: Nitrates are the last stage in the oxidation of nitrogenous organic matter. They are normally present in limited quantities in the water of all our brooks and springs. If present in excess they indicate previous sewage contamination. If absent, or only present in minute quantity, it is also a bad indication, as it shows that destructive fermentation is taking place. The evidence furnished by the determination of nitrites and nitrates is considered of great value by most sanitary authorities.

Total Solids: All natural waters leave some residue on evaporation. Even rain water is not absolutely free from this residue. Even the hardest and most refractory substances of the earth's crust are not entirely insoluble in water. As soon as water falls in the form of rain or snow upon the earth's crust the work of solution begins. The amount and kind of material dissolved will of course vary according to the solubility and kind of substance over which the water passes. The sanitary significance of total solids is subject to wide variations.

Badly contaminated water of springs or streams usually show an increase in total solids over pure waters of the same class in that locality. If these solids blacken decidedly on heating, it indicates the presence of considerable organic matter. Oftentimes a more definite idea of the character of this organic matter can be had by the odor which it emits on burning. In this way knowledge of much value is often acquired.

Having made a large number of analyses, I find the springs and streams in this locality that furnish the purest water give analytical results within the following limits;

	Parts per Million.
Chlorine,	3.00 or less.
N as nitrites,	.00.
N as nitrates,	1.00 to 2.5.
N as ammonia,	.04 or less.
N by permanganate,	.08 or less.
Total solids,	Under 65.

It is not at all true that a water from this locality is necessarily unwholesome because it does not fall within the prescribed limits in all respects. If the water comes from a limestone region, as in Chester valley, the total solids will exceed the number here given without effecting its hygienic value. The nitrogen as ammonia or by permangante may rise higher and the water still be usable. This will be true especially when these products are the result of the decomposition of vegetable matter.

In brief the analyst must seek to learn in each case, exactly what his figures signify, before he gives a positive judgment in regard to the hygienic value of a water.

One would feel more confidence in condemning a water containing animal contamination, than vegetable; yet waters containing decomposing vegetable matter are not free from danger, as they have caused intestinal disturbances of a serious nature.

The following table gives the results of the analysis of samples of water taken from the west branch of Chester Creek. Numbers 1 and 2 are the two most important springs which form the source of this stream. They are located a short distance northeast of the borough limits of West Chester. Sample 3 is taken from the stream at the southern extremity of the borough.

A comparison of the results shown in 3, with those of 1 and 2, gives some idea of the change in the water due to the sewage it receives from the town. Sample 4 was taken about three-quarters of a mile below No. 3. Between these points there is some dilution of the water. No further pollution is added, but a pond has been made between the points from which sample 3 and 4 were taken; and here, deposited filth is constantly decomposing. Sample 5 was taken from a point three-quarters of a mile further down. Sample 6 was taken above junction with east branch about three miles from West Chester. The volume of the stream here is nearly ten times that at the point at which sample 3 was taken. Sample 7 gives results of analysis of water of east branch of Chester Creek just above junction. The east branch is about one-half larger than the west. Sample 8 was taken one mile below junction of the two branches.

The changes which take place in this flow of four or five miles, so far as can be told by the results of chemical analysis, seem to be due to dilution. Sample 3 was taken from a pasture lot, and at this point the stream was utilized as a water supply for cows. The fields below this point are largely used for pasturing cattle, as has been previously stated.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8
Chlorine,	4.4	4	11.76	12.15	9.41	6.8	3.2	4.8
Nitrogen as nitrites,	....	trace.	.04	.057	.052	trace,	trace,	.0125
Nitrogen as nitrates,	2	6	2.25	1 5	1.25	2.1	1.8	2.8
Nitrogen as ammonia,	.068	.025	.164	.096	.072	.036	.164	.1
Nitrogen by permanganate,	.192	.060	.528	.596	.34	.2	.34	.304
Total solids,	64	100	150	156	128	118	90	104

The results of these analyses seem to indicate very little oxidation of the sewage. The difference in the results can be readily explained by dilution, since the volume of the stream where sample 8 was taken is probably not less than ten times as great as at the point from which sample 3 was obtained. This is in harmony with the well established conclusions of sanitary chemists that purification of water by flow is a very uncertain factor.

For a long period of years it was thought that the exposure to air and agitation to which water is subjected by its flow in small streams was in itself a sufficient means of purification. It is now known that this is not the case; but that the removal of organic impurities in water is accomplished through the agency of bacteria. The presence of a great number of bacteria in water is good evidence of organic contamination; for without organic matter as food for their support, they could not exist.

The other stream, to which reference was made at the beginning of this article, rises from a large spring within the borough. In the following table is given the analysis of the water taken from the spring; also an analysis of the water taken from the stream outside the borough. The sample was taken from the nearest field to the town in which cows were pastured at that time.

Parts per Million.

	Spring.	Stream.
Chlorine,	30.4	500
N. as nitrites,	00.0	....
N. as nitrates,	19	600
N. as ammonia,	00	1.82
N. by permanganate,	.04	1.12
Total solids,	280.5	1,068

The sample taken from the stream, judging from the results of the analysis, can be very properly regarded as simply sewage. The odor of the water was very decided. Its appearance was cloudy, and on heating the residue obtained by evaporation, the odor of burning animal matter was obtained.

I was informed by a workman who was engaged in cleaning the stream near the place where the sample was taken for analysis, that horses would not drink the water, but that cows readily drank it, and seemed ever to prefer it to other water.

Still further down, the stream receives additional pollution from a large slaughter-house and pig-pen. This refuse is carried by the stream for about two miles through pasture-lands to the Brandywine.

In the thickly settled portions of the country, many of the small streams that supply water to farm stock are more or less highly contaminated with sewage. To what extent this pollution can be carried without becoming a source of danger to horses or cows, or exerting a deleterious effect upon the milk of the latter, is a question worthy of investigation. Desiring to gain information, and failing to find any literature upon this subject, letters of inquiry were sent out to several Veterinary surgeons, Directors and Chemists of Agricultural Experiment Stations, and others.

In reply letters were received from:

Dr. W. Horace Hoskins, President United States Veterinary Medical Association.

Dr. R. S. Huidekoper, formerly Dean of the Pennsylvania Veterinary College.

E. B. Voorhees, Director of the New Jersey Agricultural Experiment Station.

Prof. F. W. Woll, Assistant Chemist University of Wisconsin Agricural Experiment Station.

E. H. Jenkins, Vice Director Connecticut Agricultural Experiment Station, New Haven.

L. L. Van Slyke, Chemist, New York Agricultural Experiment Station, Geneva.

R. C. Kedzie, Director of the Michigan Agricultural Experiment Station.

D. E. Salman, Chief of the United States Bureau of Animal Industry.

Isaiah Michener, V. S. Carversville, Pa.

W. O. Atwater, Prof. of Chemistry, Wesleyan University, and Director Storr's Experiment Station, Middletown, Conn.

A. C. True, Director of Office of Agricultural Experiment Stations, Washington, D. C.

Wm. Frear, Ph., D., Vice Director and Chemist, Pennsylvania State College Agricultural Experiment Station, Ex-officio Chemist to State Board of Agriculture.

Dr. Leonard Pearson Dean, Veterinary Department University of Pennsylvania.

Wm. B. Harvey, West Grove, Pennsylvania.

John McClintock, President State Dairymen's Association, Pa.

J. B, Phelps, Conneautville, Pa.

Eastburn Reeder, State Dairy Commissioner, Pa.

Agricultural College P. O.,
Ingham Co., Mich., September 20, 1894.

C. B. Cochran:

Dear Sir: Your favor of 15th received. In regard to influence of sewage water on health of animals, unfortunately, or fortunately rather, I can give no information, as there are no herds in our neighborhood that drink sewage water even when diluted, but there are some herds that drink from stagnant ponds, and the condensed milk factories refuse the milk from such cows for the reason that condensed milk made from such material will not keep. Careful inspection of the water supply on dairy farms is made by our manufacturers. This is reasonable, for Job, thousands of years ago, made the sensible inquiry, "Who can bring a clean thing out of an unclean?"

Wishing you success in your laudable inquiry, I remain,

Yours faithfully,

(Signed). R. C. KEDZIE.

New Haven, Conn., September 1, 1894.

C. B. Cochran, M. A., 514 South High Street, West Chester, Pa.:

Dear Sir: Yours of August 22d is before me. I cannot give you any accurate information on the point you raise. I am told that one of our creameries found it necessary to cut off from the creamery patrons whose cows had access to a very badly polluted stream because the quality of the butter was effected by their milk. I know cows do drink of polluted streams without immediately apparent effect on their health.

Possibly J. S. Kirkham of Newskings ton, Conn.. who has had trouble on account of a polluted stream can give you some light on the matter.

Truly yours,
(Signed). E. H. JENKINS.

Madison, Wis., September 11, 1894.

C. B. Cochran, M. A., 514 South High St., West Chester, Pa.:

Dear Sir: Your favor of the 22d ult. to Prof. Henry was referred to me on my return to the city after a short vacation. In reply will say that I know of no experimental data concerning the influence of sewage on milch cows or the quality of the milk produced. Lawes & Gilberts' reports on the utilization of sewage make no mention of the influence of the sewage grass on the quality of the milk. The hay fed in some of their experiments came from land that had received 9,000 tons of sewage per acre per year.

In Dammann's Gesundheitspfledge d. ldw. Haussaugethiere are given several reports of disease produced by excessive feeding of sewage hay, but of course, that is another question.

Konig has a chapter on the Danger to Cattle from Pollution of Water, in his nUters, ldw wicht. Stoffe, where he states that milch cows may easily produce milk of faulty composition by drinking from polluted water, and sums up the matter as follows: "All components of water supply which are either foreign to it and are abnormal, or which change the ordinary qualities of the water or produce an abnormal fodder, when applied to growing crops, in general condemn the water for the use of stock."

No direct experiments on the subject have ever been made to the best of my knowledge. At least, I have gone over a large share of our scientic periodical literature without finding any information in regard to the question.

Regretting I am not able to help you out further, I am,

Yours respectfully,
(Signed). F. W. WOLL.

Newport, R. I., Veterinary Infirmary.
September 20, 1894.

C. B. Cochran, Esq.:

Dear Sir: Your letter of September 11th has been forwarded to me here. The most important case I remember is where the sewage of a small town emptied into meadows below. Every horse pastured on the meadow for some years was affected with periodic ophthalmia. A drain was made to divert sewage and the disease disappeared. Unfortunately I have not my notes or library here, but will be back in New York early in October and will look the matter up.

Very truly yours,
(Signed.) RUSH S. HUIDEKOPER,

New Brunswick, N. J.,
September 13, 1894.

Mr. C. B. Cochran, West Chester, Pa.:

Dear Sir: Your favor of the 11th inst. is received. We have no expermental data showing the effect upon the health of milch cows, or upon the quality of the milk produced when the animals have access to badly polluted water. We have evidence, however, in a general way that the drinking of impure water does affect the quality of the milk and injure the health of the animal. I do not know what effect polluted water may have on the health of horses.

I am sorry that I cannot give you more definite information upon this point. I would, however, refer you to the journal of the Royal Agricultural Society for 1893, page 726, where you will find is a very excellent article upon this subject by Prof. J. Wortley Axe.

Very truly yours,
(Signed.) E. B. VOORHEES.

Washington, D. C.,
October 11, 1894.

Mr. C. B. Cochran, 514 South High Street, West Chester, Pa.:

Dear Sir: In reply to your letter making inquiry as to the effect of sewage on milk, I regret to say that we have been unable to find any literature bearing on this subject. The only case to which I can point is that reported by Vandenhoydonck and mentioned in Experiment Station Record, vol V,p. 1044. He reports a case in which all of the cows in a little village in Switzerland commenced to give bitter milk. The milk frothed badly during creaming, appeared to be in vigorous fermentation and was very bitter. The source of the trouble was finally discovered in the excessive feeding of Swedish turnips which had been washed in foul ditch water. If you are at all familiar with these European villages in farm districts you will understand that the ditch water running through the streets is very much like sewage. We have looked over the journal of the Royal Agricultural Society for the past three years but find no article on this question.

Very respectfully,

(Signed.) A. C. TRUE,
Director.

Philadelphia, September 12, 1894.

Mr. C. B. Cochran:

Dear Sir: I am in receipt of your favor of September 8, but I am sorry to say that I cannot refer you to any literature bearing specially upon the subject of your letter. I can only say that the most I have noted on this subject myself has been occcasional articles in current veterinary journals where serious and fatal illnesses have been attributed to the drinking water from impure streams, ponds, etc. I am led to believe from personal observations that impure water supply and streams that are polluted by sewerage and other offensive products are very great factors in the production of diseased conditions that have heretofore been generally attributed to other causes. I mean by this to say that the drinking water is not only the direct cause itself, but many, many times a vehicle, for admission to the system of poisonous products that produce many forms of disease that still remain clouded as to the exact method of propagation.

Very truly yours,

(Signed.) W. HORACE HOSKINS.

Geneva, N. Y.,
August 31, 1894.

C. B. Cochran, West Chester, Pa.:

Dear Sir: I know of no published literature referring to the subject you mention. It is a well-known fact among cheese makers that an impure water supply for cows will cause the milk to produce floating curds, a usual sign of contamination of some sort. Cheese factories located in low places are much more troubled in this way than in upland places. In dry seasons all factories are more troubled than at other times. These observations all go to show that the milk is seriously affected by impure water supply for cows, so that their milk is more or less unfitted for giving the best results in cheese making.

Very truly yours,

(Signed.) J. L. VAN SLYKE.

State College, Centre county, Pa.,
October 5, 1894.

C. B. Cochran, 514 High Street, West Chester, Pa.:

Dear Sir: Pardon my long delay in replying to your queries concerning the influence of sewage-polluted water upon the health of cattle. I have been so pushed this fall by routine work that I have been unable to go over the literature at my command to see what there is bearing directly upon it.

I regret that I find practically nothing of direct bearing; nothing I fear which you have not already in hand.

The question resolves itself into several:

1. Are the chemical impurities of sewage water injurious to horses and cows?
2. Are the human disease bacteria of such water (a) likely to transmit disease to the cattle; (b) likely to pass into the milk by external or internal methods of communication?
3. Do specific germs of bovine or horse diseases occur therein, and are they likely to be taken up from such media?

I suppose we may lay the same stress upon the chemical impurities in the case of cattle as of men. I find no specific instances of injury.

As to the transmission of human disease (such as tuberculosis, e. g.) to cattle through water, I find nothing specific. But the observation of Auerbach regarding the transmission of the bacilli of green foods to milk by means of the animal is very suggestive; it needs corroboration, however.

Finally, the peculiarity of outbreak and localization of the so-called "miasmatic" diseases of cattle (anthrax, black quarter, etc.) and of similar diseases of the horse,would indicate a sewage polluted water as an excellent place for such germs to thrive.

Nor can it be questioned that city sewage derived from stables and abbatoirs, in part, would carry diseases of cattle as well as of man; only it would very rarely happen that cattle drink such water The sewage pollution to which you refer is from the farm or village privy and from the barnyard.

I have gone carefully over my comqlete file of the Vierteljah ersschrift fur Nahrungs und Genussmittel-Chemie; over the last five years' volumes of the Jahresbericht der Agrikultur-Chemie; over the index of the Office of Experiment Stations (covering American experiment station investigation); over the special treatises issued by the Bureau of Animal Industry upon diseases of horse and cattle, and over Grotenfelt's new work on bacteria in relation to the dairy. It may be that as I was obliged to cover the ground hastily I have overlooked something of importance, but I believe not. Certainly the indexes show nothing upon the subject. I am just on the eve of a business trip and am obliged to write very hastily. Please pardon the summary fashion of this letter.

I shall be very happy to do anything further I can for you.

Very truly,

WM. FREAR.

The following notes on influence of drinking water (its quality and purity) upon milk, accompanied Dr. Frear's letter:

Grotenfelt, Principles of Modern Dairy Practice from a Bacterigical Point of View, 1894, makes no reference to the subject.

The Zeitschrift des Landes Zentralvereins fur die Provinz Sachen (Molkerie Ztg., 1890, 12.) emphasizes the need of drinking water free from harmful contamnation (products of putrefaction), but gives no evidence to support its directions. (Vyschr. Chem. Nahr. u. Genussmittel, 5, 3.)

N. Auerbach (Agricultural Science, 8, 35-6), concludes that milk from cattle fed with green foods is contaminated by Bacillus butyricus, but that this bacillus is absent when dry foods are fed. He believes this germ resistant to the destructive influences of the digestive tract, and that it is in some manner conveyed from the faeces into the milk.

Dr. Michener (Special Report on Diseases of the Horse, U. S. Bureau of Animal Industry, p. 16), writing of water standing in hollows in pastures, says: "Such water is stagnant. The organic matter soon undergoes decomposition, and, as a result, we find diseases of different kinds more prevalent where this water is drunk than where the water supply is wholesome."

John C. McClintick, president of the Pennsylvania Dairyman's Association, writes that at one time his cows were pastured where the water became very impure during the dry season of the year, and that this water produced disease. After driving wells and thus obtaining a supply of pure water no further difficulty was experienced.

Wm. B. Harvey cites an instance where cows, though having plenty of good water, drank the sewage from the house. The cream was bad and it was some days before the cause was detected.

Dr. Michener calls attention to the activity of secreting glands of the lacteal system during the season when a cow is giving a full flow of milk, and shows as a matter of common experience how readily toxic and medicinal principles find their way into this liquid, and infers that any poisonous principles existing in sewage would also find their way into the milk, the only question being whether the amount is sufficient to produce serious danger. He states that horses pastured where they drink stagnant or impure water, breed millions of worms, and that these worms readily cause the death of young colts.

Mr. J. B. Phelps states that at a certain cheese factory the milk worked badly, developed a bad odor, and the cheese made from it was anything but good. The trouble was finally traced to a single cow which had chosen to drink foul water, although pure water was more easily obtained. This case is remarkable, and f the cause as just given was carefully and accurately worked out it should be published in full detail.

A few years ago a gentleman residingon a farm near West Chester lost by disease six horses during one summer. These animals were all in one pasture. The stream flowing through the pasture was fouled by refuse from a creamery and pig pen. Some slaughtering was also done near its banks. Te samples of water were taken from the stream for analysis; one from the pasture, the other above the pasture, about one-eighth of a mile from the principal source of pollution.

Parts per Million.

	Cl.	N as Nitrates.	N as Nitrates.	N as Ammonia.	N by Permanganate.	Total Solids.
Sample from pasture, ...	8	.01	.75	.76	.33	96
Sample near creamery, . . .	87.4	.2	. . . .	6.96	1.56	660

The samples were taken on the same day, and the difference in the results is due to the dilution produced by receiving watr from othr sourcs. As th sampls were taken after a recent rain the dilution was undoubtedly greater than usual. During the time that the trouble was greatest and the horses were dying, a colt from another pasture got into the pasture supplied by the suspected stream. In order to more positively locate the cause of the disaese, the colt was allowed to remain. In seven days it became sick, and forty-eight hours after it showed the first symptoms of illness it died. Soon after this stream was cleaned. No more refuse was allowed to enter it and there has been no further trouble.

In conclusion I wish to say that it is not the purpose of the writer to attempt to create a scare, or to produce any radical changes, but to call the attention to the fact that the pollution of streams may be, and in some cases doubtless has been, carried so far as to enbanger the health of domestic animals and to render cow's milk abnormal. This furnishes an additional reason why such pollution should as far as possible be avoided. In many cases this can be accomplished with little expense, or it may be even as a matter of economy, for much refuse matter that is allowed to drain off in this way might profitably be retained for its value as a fertilizing material.

REPORT OF THE ENTOMOLOGIST.

BY PROF. R. C. SCHIEDT,* *Entomologist of the Board, Lancaster, Pa.*

In presenting my first report on the work done during the past year as one of the honorary entomologists to the State Board, I state at the outset that it contains nothing new to the scientist; but instigated by a large number of inquiries received from all parts of the State, I deem it advisable to repeat, what may seem a superfluous description of the most frequent agricultural enemies. The general ignorance of entomological facts, so prevalent even among the most intelligent farmers, warrants the repetition of literature that is so generously distributed by the United States Department of Agriculture from year to year. The importance of this work can only be properly appreciated, when we consider the enormous losses incurred every summer season from insect ravages. Twenty-five years ago Mr. B. D. Walsh, the entomologist of Illinois, estimated the loss from this source at from $200,000,000 to $300,000,000 per annum. Fitch, then New York State entomologist, estimated the damage to the wheat crop of that State in the year 1854 by the wheat-midge at $15,000,000, whilst the chinch bug caused in the State of Illinois alone a loss of $73,000,000 to wheat and corn in 1867. Dr. C. V. Riley says in the same bulletin

(June, 1891, pp. 397,398), from which the above facts are quoted: "I have repeatedly published the general estimate that the average annual loss to the United States from injurious insects exceeds $300,000,000." In view of such appalling statistics it would seem hardly necessary for me to urge the teaching of entomology in all our common schools, in order to disseminate a more intelligent treatment of its economic importance, and who would deny the imperative demand for specially organized work in this direction? Pennsylvania is one of the few States in the Union which does not own a specific entomological experiment station, through the aid of which alone effectual results can be expected. Private efforts may accomplish something, but it is only by means of a constant warfare proceeding from a well equipped and completely manned experimental fortress that abiding exterminations of the annual ravages can be obtained. The United States Department has its agents in fields which are under the supervision of the respective States, that have made room for them, and serves as the highest court of appeal in difficult cases. Without the proper facilities I can hardly be expected to give our farmers in Pennsylvania that aid which is rendered through personal inspection and original research, and must, therefore, be pardoned, when I present a report largely embodied in previous publications.

The following injurious insects were identified by me during the past year upon request of Secretary Thos. J. Edge: Potato stalk Weevil (Trichobaris, Baridius, trinotata); Striped Blister Beetle (Epicauta vittata); wire worms (Elateridae); Hessian Fly (Cecidomyia de structor); Grain Aphis (Siphonophora avenae); Wheat Midge (Cecidomyia tritici); Clover Rootborer (Hylesinus trifolii); Clover Leaf Beetle (Phytonomus punctatus); Clover Stem Borer (Languria Mozardi); Clover Mite (Bryobia Pratensis); several species of Sphenophorus the Elm Leaf Beetle (Galeruca kauthomelaena); the larvae of Sciara and specimens of Achorutes armatus, spring tails infesting houses. A full description of the life history and habits of the insect was given in each case and remedies suggested. Last year's report of the State Board of Agrculture contains descriptions of the wire worms, the clover leaf beetle and the clover root borer (pp. 93-96) to which nothing new can added, which are, therefore omitted in the present report. Perhaps the most serious damage was done by the Potato Stalk Weevil, the Striped Blister Beetle, the Hessian Fly, the wheat midge and the clover stem borer, to which we shall pay special attention.

The clover stem borer (Languria Mozardi, Fig. 1,) has been frequently referred to an entomological literature, viz: By Comstock, Report Department Agriculture, 1879, pp. 199-200; by Weed, Bull. Ohio Experiment Station, second series, Vol. III, No. 8, p. 235; by Chittenden, "Insect Life," Vol. II, p. 346. The general supposition that it developed exclusively in clover, has lately been dispelled, inasmuch as it has been proved that the insect breeds more freely in certain weeds of the Composite family, than in clover. Personal observations which I made in a number of clover fields last summer confirm this statement and suggest, at the same time, a remedy. If it would be possible to displace the awkward fences separating various tracts of land of different ownership by narrow strips of neutral ground, experiments could be carried on in regard to the proper weed food of many injurious insects; the neutral soil would offer opportunities for the cultivation of such weeds and with proper care the ravages could perhaps be reduced to a minimum.

The adult insect is about one-fourth of an inch long, with yellowish red thorax and shining bluish-black wing covers. The larva has a slender, cylindrical body, with three pairs of pro-legs at the posterior extremity. The pupa is of a yellowish color. The eggs are about the size of the point of a pin, and are laid in the lower part of the stem of a great variety of plants, where the larvae are developed and pass the winter feeding on the pulp of the stalk. Mr. F. M. Webster found the pupa in a well developed gall on a stock of wild lettuce, from which the beetle escaped sixteen days after discovery.

The fact that the insect feeds on a great many wild plants insures against serious damage. The only remedy suggested is an early summer, followed by fall cutting.

The Clover Mite (Bryobia pratensis, Fig. II, greatly enlarged), described by Riley & Marlatt, "Insect Life," Vol. III, p. 45, from which the substance of the following account is taken:

Bryobia pratensis belongs to the family of vegetable-feeding mites, Tetranychidae, which includes the well known red spider of hot houses and the six spotted mite of the orange, described in the annual report of the U. S. entomologist for 1889. It occurs very commonly in the northern and central States from Massachusetts to California, and is especially annoying on account of its habit, frequently developed in spring and autumn, of migrating in enormous numbers into houses. This bryobia has repeatedly been confounded with the red spider (Tetranychus telarius) on account of general resemblance in habit, shape and color, and of its occurrence on trees and plants out of doors. It was first characterized scientifically in 1885 by Mr. H. Garman, in Forbes' third report, pp. 73, 74. Concerning its ravages, Prof. Forbes reported the following: At Normal, early in May, the general occurrence of a large and conspicuously brownish red mite was noticed upon clover and blue grass, the former of these plants especially, sometimes suffering severely from the pest. The leaves of the clover turned yellow, and their growth was arrested where the mite was abundant. The effect on the blue grass was similar.

The first reference to the occurrence of this mite bears date of March 21, 1879, when eggs and young together with adult mites were found abundantly on twigs and bark of the elms in the agricultural department ground. On May 9 it was found to infest the leaves of the red clover in great numbers throughout the city of Washington. Since 1879 these pests have been observed every spring and summer, chiefly on clover, but also on various trees, notably apple, elm and peach; and in the fall and winter on or beneath the bark and at the angles of the branches of trees, occurring in connection with numerous eggs and young in various stages of development. Their blood-red eggs have frequently been observed in numbers sufficient to impart a reddish color to the trunks and branches of the infested trees. The U. S. department reports only one account of their attacking homes in the east, while in the central States the inconvenience occasioned by their presence in houses has been more frequently reported. It is interesting to note, then, that the appearance of this mite in the houses of various districts in Lancaster county, together with a species of spring tails (Alchorutes armatus) is the second instance reported in the east.

As would be naturally expected, the wide range of this mite gives it a somewhat variable habit. In the more northern regions and at higher elevations the winter is passed principally, if not altogether, in the egg state. The mites, or the last brood (there are evidently several broods) come to maturity in fall and deposit their eggs on the trunks and branches of the trees, frequently in sufficient numbers to entirely cover the bark of the trunk and branches to a height of several feet. The young mites issue during March and April following, or later in higher elevations. When large numbers of the last brood of mites winter over, they evidently invade in fall and spring dwellings in search of food, as was the case in Lancaster county. They may also abandon the clover and leaves of trees early in October and secrete themselves, especially in crevices, in the bark and under loose bark of various trees, where they are found together with eggs the following season.

The foregoing would indicate that the mite is a very general feeder of the forage plants. Clover and timothy are especially attacked, the former being perhaps the ordinary food-plant of the mite. Of trees, the apple and arbor-vitae are frequently infested with all stages during summer, and the occurrence of eggs and adults in fall and winter on almond, plum, prune, poplar, elm and other trees would indicate that they are also attacked.

In the case of its occurrence on fruits or shade trees it can doubtless be controlled or destroyed by spraying with kerosene emulsion, to which sulphur may be profitably added at the rate of two or three ounces to the gallon of the wash. In the case of forage crops spraying would be impracticable and no effective method of combatting the pest can at present be given.

The importance of this mite arises chiefly, however, from the annoyance of its infecting houses, against which the following measures should be taken, according to Riley and Marlatt:

In the event of an invasion of these mites the lawns about the buildings, and, if practicable, the sides of the buildings, should be sprayed with kerosene emulsion. The lower portion of the building, walls, etc., may be treated with pure kerosene with advantage. These applications should be repeated every day or two, or as often as necessary to destroy or repel the mites. Infested houses may be freed by spraying with benzine, which may be used freely without danger if care is taken that no fire is present, as this substance vaporizes rapidly and is highly inflammable. A thorough airing will remove all traces of the odor of this substance.

My own advice to the people in Lancaster county was to use coal oil freely, which seemed to expel the mites with wonderful rapidity.

Description of Various Stages. The egg is about 0.19 inch in diameter, spherical in shape, vermillion in color, emitting a lustre; they are placed singly, or in masses, covering bark of trees to a depth of from one to three layers. The young larva is 0.18 by 0.22 inch in size, nearly circular, also of vermillion color; surface irregularly straight. Three pairs of legs, all five-jointed, not exceeding body in length, second and last joints longest, the first pair of legs slightly exceeding the others in length; tarsi surrounded with six-knobbed hairs, two at the tips and the other four near the base. Eyes, two, situated on a reddish-purple triangular spot a little back of the center and near the edge of the cephalothorax. Cephalothorax one-third less in size than abdomen. Scale-like appendages of the adult occur on the larva in same number and position, but are more elongate, being more in the nature of serrate spines, frontal process wanting, but in place of them occur two serrate spines projecting forwards. The position of the spines on the body is as follows: Two projecting from the anterior extremity, one in front and one behind the eyes; one at anterior angle, two pairs closely placed near lateral margin, three arranged in triangle near posterior margin of abdomen, three pairs on dorsum of abdomen, making in all twenty-eight spines. In later stages the full complement of legs, as also the anterior scale-tipped projections, appear after first or second molt; the legs in relative length and in length of joints approach those of the adults, but are shorter and stouter; the scales of body also become like that of adult. Little change in color occurs until nearly full size is reached. (Riley.)

Sphenophorus pulchellus (Fig. III) not reported to my knowledge, and therefore little known as to its habits, was identified by me in several stalks of wheat and roots of corn sent from the southern part of Lancaster county. An examination of the roots showed full-grown larvae and fully developed adults within the bulb of the corn. From what is known of the habits of other species reported by entomologists since 1858, its life history may be as follows: The insect evidently hiberates in the adult stage, which it leaves in spring. The females deposit their eggs during May and June, the larvae hatching from these develop to adults and emerge in about three weeks. The only remedy suggested is to plow up and burn the stubble. It is, however, necessary that a further experimental study of this species should be made in order to give an intelligent description of its life, habits, etc.

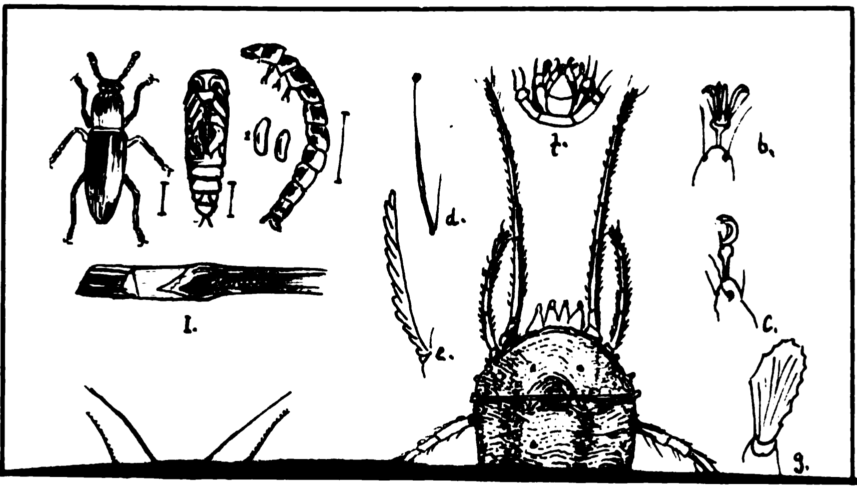
The Wheat Plant Louse or Grain Aphis (Siphonophora avenae, Fig. III), described by Riley, Dept. Agric., 1889, p. 348, caused considerable damage to wheat and oats in certain districts of Pennsylvania. It is a small greenish or brownish aphis, with or without wings, which breeds upon wheat, oats and various plants of the grass family. Belonging to the order of Rhynchota or bugs, its mouth parts consist of a pointed beak, by means of which it sucks out the sap of leaf or stem. From the ripening wheat it passes to the more succulent oats, and from thence to the various grasses. Dr. W. T. Burnett gives the following brief summary of the mode of development in this group: In the early autumn the colonies of plant-lice are composed of both male and female individuals (although they have never been found in this particular species, R. C. S.); these pair, the males then die, and the females begin to deposit their eggs, after which they die also. Early in the spring, as soon as the sap begins to flow, these eggs are hatched, and the young lice immediately begin to pump up sap from the tender leaves and shoots, increase rapidly in size, and in a short time come to maturity. In this state it is found that the whole brood, without a single exception, consists solely of females, or rather and more properly, of individuals which are capable of reproducing their kind. This reproduction takes place by a viviparous generation, there being found in the individuals in question, young lice, which when capable of entering upon individual life, escape from their progenitors and form a new and greatly increased colony, consisting of millions of individuals. This second generation pursues the same course as the first, the individuals of which it is composed being like those of the first, sexless, or at least without any trace of the male sex throughout. These same conditions are then repeated at least through nine generations in one season, the terminal brood being considered to be composed exclusively of females and males, or, in other words, of perfect insects of both sexes.

The injury of these insects is chiefly manifested by the shriveling of the grain in infested fields. But many natural enemies, chiefly among which are Syrphus flies, Coccinellae, etc., keep them within proper limits in nature. When an aphis has received an egg from one of these parasites it quits its companions and fastens itself by its ungues to the under side of a leaf, when it swells into a globular form, its skin stretched out and dried up, and in a short time the perfect parasite escapes by a circular hole, the mouth of which sometimes remains like a trap door.

As yet no practical artificial remedy for the grain aphis is known. Kerosene emulsion is a sure killing agent, but when they occur on the under surface of the leaf it is difficult to reach them. Only their enemies and the weather can be relied upon.

The Striped Blister Beetle (Epicauta vittata, Fig. IV), described by Riley, 1st Rept., Ins. Mo., pp. 96-97; 1st Rept. U. S. Ent. Com., pp. 293-302, is sometimes called the old-fashioned potato beetle, because it was known as the "potato beetle" before the introduction of the more modern and more destructive Colorado species. It is only injurious in the adult stage, since it feeds as a larva on the eggs of certain grasshoppers, thus destroying them. The adult blister beetle is a slender-bodied, rather long-legged insect, from one-half to three-fourths of an inch long, with alternate stripes of black and yellowish brown upon the back. Generally gregarious, these beetles feed in large flocks and easily take to flight when disturbed. The females deposit their small eggs in masses of a hundred or more in the soil, just below the surface. In about ten days the eggs hatch into curious little larvae, burroughing through the soil in search of grasshopper eggs. Those that survive undergo, according to Dr. Riley, a curious series of changes,called hypermetamorphotic, finally becoming pupae, and emerging later as beetles. For reasons, mentioned above, the beetles are generally destructively numerous during seasons following those in which grasshoppers have been abundant. Among the other species of blister beetles the black blister beetle (Epicauta pennsylvanica) is the commonest in Pennsylvania.

Dr Clarence M. Weed says in his book on "Insects and Insecticides," in speaking of the remedies: "It is sometimes stated that these insects are not destroyed by eating Paris green, but this is doubtless a mistake. The application of this substance, however, seems often to be of no avail, probably either because it does not act immediately upon the beetles, or else because they continue to invade the field from the outside. A few years ago a favorite method of destroying them was to drive the flocks of beetles upon loose hay or straw spread upon the ground near where they are at work and then burn the hay, lighting it at several different places, so that it will burn rapidly. Hand pick-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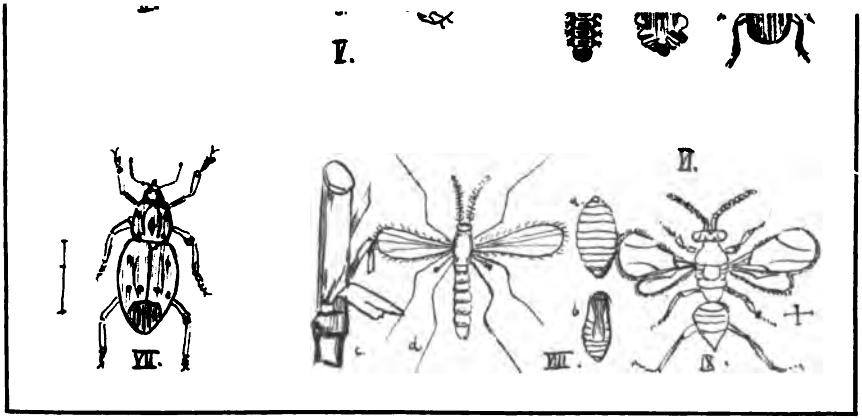
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IX.

ing can often be resorted to advantageously. It is doubtful policy, however, to destroy these insects, except when they threaten to do serious damage, because of the grasshopper-egg feeding habits of the larvae."

The Potato Stalk Weevil (Thichobaris, Baridius, trinotata, Fig. V), described by Riley, 1st Rept. Ins. Mo., pp. 93-95, has been one of the worst insect pests of the past season. It is a common species in the middle and western States, where it causes the stalk to wilt and die. The beetle is of a bluish or ash gray color, distinguished, as its name implies, by having three shiny black impressed spots at the lower edge of the thorax. The female deposits a single egg in an oblong slit about one-eighth of an inch long, which she has previously formed with her beak in the stalk of the potato. The larva subsequently hatches out and bores into the heart of the stalk, always proceeding downwards toward the root. When fully grown it is a little over one-fourth of an inch long, a soft, whitish, legless grub, with a scaly head. It is the work of the larva which causes the plant to wilt and die. A few weeks later, still within the stock and slightly below the surface of the ground, the larva pupates, and late in summer or early in autumn it emerges as an adult weevil. This weevil passes the winter under any protecting covering it may find, and the following season starts another generation by depositing its eggs in the potato stalks.

According to Prof. Gillette, the only remedy at present known is to pull the weeds as soon as they are found wilting and burn them. If the tops are left until it is time to dig the potatoes many of the beetles will have matured and escaped, and these will live over winter and lay eggs for another brood. But even late pulling and burning will destroy many of the pests, and in regions where this insect is known to be at work, the weeds should be burned when pulled up in harvesting the crop (Weed).

The Hessian Fly (Cecidomyia destructor, Fig. VIII), described by Packard, Bull. No. 4, U. S. Ent. Com., p. 43 ; 3d Rept. E. S. Ent. Com., 198; Forbes' 14th Rept. Ins. Ill., p. 38; do. 15th Rept. Ins. Ill.,p. 21, is one of the oldest and best known insect pests of American agriculture. Its ravages have been felt for more than a century in every country where wheat is cultivated. The adult is a small two-winged mosquito-fly, the wings have usually three longitudinal veins, and are folded over the back. The female has generally two broods, as the flies appear in spring and autumn. At each of these periods the fly lays, according to Dr. Harris, twenty or thirty eggs on the upper surface of the wheat blades in autumn or in a crease in the leaf of the young plant in spring. In about four days in warm weather they hatch and the pale red larvae descend the leaf to the base of the sheath, where they attach themselves, head downward, to the stalk a little below the surface of the ground and proceed to absorb the life sap of the plant. By the simple pressure of their body they become imbedded in the stalk with the latter's growth. In about three or four weeks the larvae reach their full size, about three-twentieth of an inch, and are then soft, white footless maggots of the form represented in Fig VIII, a. About the beginning of December their skin hardens, becomes brown and then turns to a bright chestnut color, at the same time separating from the rest of the body and forming a sort of cocoon, or puparium, within which the insect changes to a pupa (b). This is the "flaxseed" state so-called because of its resemblance to flaxseeds. Towards the end of April or the beginning of May the pupa becomes fully formed and at the time when the wheat is just coming up the flies emerge from the "flaxseeds" to lay eggs for a period of three weeks, after which they entirely disappear. The larva of the fall brood attack the wheat just above the roots while the spring generation are formed a little higher up; at the joints an inch or more above the soil surface. This second generation completes its life history before fall; often a third brood develops during summer in volunteer wheat, which, however, does but little damage.

There are several species of insect parasites which attack the Hessian fly, most prominent among which is Semiatellus destructor (Fig. IX), which pierces the larva through the sheath of the leaf.

The remedies suggested are late planting, selection of wheat and rolling and pasturing to sheep. Dr. C. M. Weed says: "The most promising method of preventing the injuries of this insect appears to be that of inducing the flies to deposit their eggs in young wheat, and then destroying it, where a third brood develops in volunteer wheat this end may be accomplished by turning under this volunteer growth when the Hessian fly larvae are about half grown; or in case no such brood develops in the volunteer wheat, a few strips in the field may be seeded to wheat a few weeks before the regular planting time, and the flies will lay their eggs in these, which are afterwards to be plowed under. Thus the mass crop of wheat will escape infestation."

The Wheat Midge (Cecidomyia Diplosis, trictici) is closely related to the Hessian fly, its wings are transparent while those of latter are blackish. It attacks the wheat in the ear and as such was especially destructive in certain sections of Pennsylvania during the past season. When the wheat is in blossom the small, two-winged, yellow or orange-colored fly appears in the fields and lays its eggs in the evening by means of long retractile tube-like extremity of the body, within the chaffy scales of the flowers, in clusters of from two to fifteen or more. In eight or ten days these eggs hatch into little footless transparent maggots, afterwards becoming orange colored; they attack the young germ or kernel, which by pressure becomes shrivelled and aborted. In about three weeks, i. e., at the end of July they become full fed, leave the head, enter the ground after moulting their skins, leaving them entire in the ear and pupate. There is but one brood each year. Besides wheat the midge is said to bred in rye, barley, oats and, possibly grass.

Dr. C. M. Weed suggests, that "early maturing grains are less liable to be infested by this insect than those ripening later. Consequently farmers in regions where it is at present plant such varieties early, with general high culture. Many of the insects will be destroyed by the deep plowing of the infested fields."

The pupa of the Cecidomyia resembles that of the fungus-eating Tipulids, such as Sciara. I received several letters of inquiry in reference to the latter. Their larvae are footless, about five lines in length, and about one third of a line in diameter. They are composed of thirteen segments and have small black heads.

In some years during the month of July there may be found on the borders of forests immense trains of these larvae, formed by the union of an innumerable quantity fixed to each other by a sticky substance. These collections of larvae resemble a strange animal of snake-like form, several feet long, one or two inches in thickness, and formed by the union of an immense number, which cling to each other by thousands, and move on together, leaving a track after it on the ground, the best indication of its presence. These masses may be from ten to twelve yards long; M. Guerin Meneville whose description we follow observed columns as many as thirty yards in length. They advance as slowly as a snail and in a certain direction. If they encounter an obstacle—as a stone, for instance—they cross over it, turn round it, or else divide into two sections, which reunites after the obstacle is passed. They are never met with in bad weather, but only when the sun is warm. This curious phenomenon was observed for the first time in 1603 by Gaspard Schwenefeld, who says that the inhabitants of Siberia consider this phenomenon as an indication of a bad harvest if they go towards the mountains, whereas if they descend towards the plains, it is the sign of a good one; a great many other superstitions are reported in connection with it. It has not yet been proved, however, that they ever caused any damage to agriculture. Their habit of clinging together may be explained by the necessity these insects feel for mutual protection against the drying effect of the atmosphere when they are forced to leave the ground. They generally migrate towards a suitable place to undergo their metamorphosis.

The Elm Leaf-Beetle (Galeruca Xanthomelaena, Fig. VI), described by Riley in Bulletin 6 of the Ent. Div., proved as obnoxious during the past season as ever before. It is an immigrant from the Old World, having been especially injurious in France and Germany, and is supposed to have been imported into America during the early part of the present century. A correspondent reports in the Bull. of U. S. Dep. of Agric., Vol. II, p. 377, that they had entered the house in great numbers, never injured anything, except that they liked to sleep in one's bed and filled drawers, boxes, books, etc.

"The eggs are laid on the under side of the leaves in two or three rows, each group consisting of from five to twenty eggs, lying very close together and fastened securely to the leaf. In about a week the larvae hatch and begin eating the leaves causing them to look as though riddled with fine shot. They become fully grown in two or three weeks, when they descend to the ground, and, finding some convenient shelter change to pupae. Ten days later the perfect beetles come forth and eat the leaves, although the damage done by the insect in this beetle stage is much less than that done by the young, growing larvae. There are three or four broods each season, and the beetles pass the winter in whatever shelter they can find, especially congregating in hollow trees, and under old leaves." (C. M. Weed).

This pest can be best met by spraying with London Purple or Paris Green (4 ozs. to 50 gals. of water). Prof. John B. Smith in "Garden and Forest" for June 19, '93, gives an account of his experiments in spraying large elm trees on the Rutger's College campus. He used a Seneca Fall force-pump, mounted on a tank holding 40 gallons and provided with a 50-foot hose. The end of the hose is attached to a 10-foot pole, and by means of a light ladder 20 feet in length the foliage of the largest trees, some of which are over 50 feet in height, can be reached. Professor Smith finds that the addition of a small quantity of kerosene emulsion to the mixture of London Purple and water is of use in enabling the spray to penetrate the pubescence on the under side of the leaves and to spread wherever it touches instead of collecting in drops and falling. He recommends the addition of a pint of kerosene emulsion to 20 gallons water containing one-fifth of a pound of London Purple, and states that this amount of mixture is sufficient for one of the largest trees. The application should be made when the eggs are being laid, in order to kill the larvae before they have done any damage.

In conclusion I take pleasure to call attention to the Pennsylvania State Bulletin, No. 19, April, 1892, in which Mr. George C, Butz, of the Pennsylvania State College Agricultural Experiment Station, furnishes directions for the preparation and application of the principal chemicals used against insects and plant diseases, which may be supplemented by Dr. C. M. Weed's little manual "Spraying Crops."

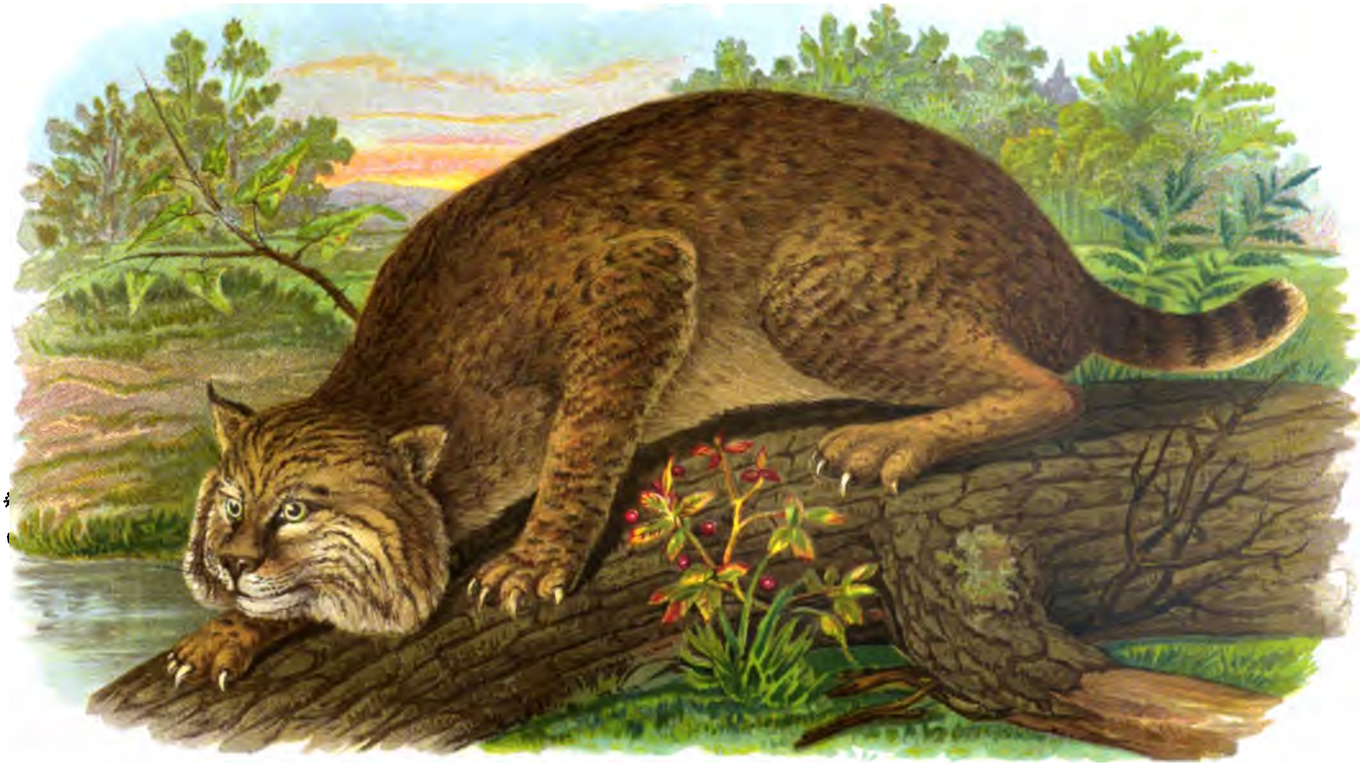
THE WILD CAT.

Lynx rufus (Gm). Raf.

BY B. H. WARREN, M. D., *Ornithologist of the Board, West Chester, Pa.*

DESCRIPTION.

Fur moderately full and soft. Head moderate size and rounded; body rather slender; legs long and quite stout; soles of feet naked. Ears large, erect and nearly triangular in shape, and tipped (in winter specimens) with coarse black hairs fully half an inch long; inner surface of the ears furnished with a loose coat of long, pale, yellowish-white hairs, and the outer surface is covered with short fur, which is black, except a conspicuous patch of dull white in the centre. Forehead grayish-brown, irregularly streaked with dark brown; whitish streaks above and below the eyes; whiskers for the most part are white; chin and upper part of throat white, lower part of throat and neck very similar to sides, but paler. The upper parts and sides of the body and legs (outer portions of the latter) are pale rufous or brownish-red overlaid with grayish, which latter color is produced by the whitish ends of the hairs; the rufous coloration is most noticeable on sides of the body, sides of the head below and back of the ears, and about the occipital (base of head) region. The sides are indistinctly spotted with dark brown, and down the middle of the back a more or less distinct line of blackish-brown extends from near the shoulders to the base of the tail. Under surface of body and legs white and pale-yellowish spotted with black; insde of front and hind legs banded and spotted with black. The irides (eyes) of the adults are greenish-yellow in color, but in the young they are brown. Individuals of this species vary greatly in coloration. In fact it is an exceedingly difficult matter to find two specimens exactly alike. Ten specimens, now before me, captured in Pennsylvania during the winter season, show a marked diversity in color, as well as in size, and two or three individuals taken in the late spring or early autumn, which I have examined, are decidedly more brownish-red in color, particularly on the sides, than those killed in the winter. The male is considerably larger than the female. In the month of January, 1890, I secured five females in Cameron and Potter counties, Pennsylvania, which weighed respectively ten and one-half, twelve, twelve and three-fourths, nine and one-fourth, and thirteen pounds, or an average of about eleven and one-half pounds each. Three adult males which I captured in Pennsylvania during the months of January, February and April, within the past five years, weighed respectively fifteen and one-fourth, seventeen and eighteen and three-



WILD CAT.

1/26 NATURAL SIZE.

fourths pounds, or an average of seventeen pounds each. In the winter of 1892 Senator Harry A. Hall, of St. Mary's, presented me with a very fine male which had been killed near his home in Elk county. This animal, which is the largest I ever saw weighed, tipped the scales at twenty-six and one-half pounds. Hunters and woodsmen whom I believe to be reliable, have assured me that wild cats are sometimes taken which weigh thirty-five, forty and fifty pounds each.

The majority of hunters and woodsmen who reside in sections of Pennsylvania where the wildcat or bay lynx occurs, have various local names for this wary and prowling animal. The appellations bob-cat, catamount, mountain cat and tiger cat are perhaps the ones which are most frequently employed. These names, or any others which may be heard, it is safe to say have reference to the Lynx rufus, which is doubtless the only species of its genus found in our State.

During the past five years I have made very careful inquiries in all sections of the Commonwealth where the Canada lynx was reported to occasionally be present, and I have also examined a number of specimens of what were called by the owners "Lynx canadensis," but as yet I have not been able to discover a true example of the Canada lynx which may be distinguished from its congener, the common wildcat, by its larger size, longer hair, fuller fur, grayish, hoary color, thick, heavy and clumsy legs and the large-sized feet, which are so densely furred (in winter) as to cover the soles or pads. The ears are also very conspicuously tufted with long black hairs.

There are, however, it is said, two or three well authenicated instances where specimens of the Canada lynx have been taken in Pennsylvania within the last twenty-five years. Possibly future investigations will enable us to record this decidedly northern animal as a rare inhabitant of our forest areas.

From repeated interviews with hunters and woodsmen it is learned that the catamount is very generally believed to be a wholly different species from the wildcat. However, on questioning these persons closely I find that size is about the only distinctive point they can call to mind to support their claim, and all large-sized cats are denominated "catamounts," and on the other hand the smaller ones are termed wild or "bob" cats.

The indiscriminate employment of local names to distinguish many of our birds and mammals oftentimes leads to much confusion, but until the great mass of our citizens become better acquainted with the furred and feathered inhabitants such errors are bound to occur. In this connection it may be stated that through the wise efforts of our progressive and intelligent State Superintendent of Public Instruction, Dr. N. C. Schaffer, and his able assistants, much good work has been done to create a popular interest in zoological study throughout the common schools of the State. If Dr. Schaffer's ideas are carried out as they should and doubtless will be, the time will soon come when our school children will be readily able to recognize and speak intelligently of, at least, the common birds and mammals which they see about the parks and gardens, in the fields or meadows, on the rugged mountain side, in the shady forest, or along the river bank.

The wildcat inhabits forests, rocky ledges and briary thickets, but its favorite place is in old slashings and bark peelings, where in the impenetrable and tangled recesses it is comparatively safe from pursuit, and also able to prey upon many varieties of animals which have a permanent or temporary residence in such unfrequented wilds.

There are large tracts of land in the mountainous districts of Pennsylvania from which the marketable forest trees have long since been cut off. These places, called slashings and bark peelings, in many instances are thickly strewn with decaying logs, fallen trees, that were cut down for the bark, brush piles, tree tops, and so overgrown with bushes, young trees, briars, and frequently large patches of buck laurel (rhododendron) as to be almost impassable unless one selects the old log roadways which traverse such areas. In these places rabbits and other quadrupeds, pheasants and many different kinds of small birds find an excellent cover.

Through my own personal observations in the field and also from the statements of thoroughly trustworthy hunters, trappers and lumbermen I am of the opinion that this species has been increasing during the last three or four years in several of our counties, namely, Elk, Cameron, Centre and McKean, where large districts have been denuded of their forest trees.

The wildcat subsists entirely on a flesh diet, and the damage this species does in destroying poultry, lambs and young pigs of farmers who reside in the sparsely settled mountainous regions is not in any degree compensated for by the destruction of other small wild animals which molest the farmer's crops or his poultry.

Wildcats, as will be seen by consulting the testimony of numerous contributors on the latter pages of this article, are very detrimental to game. They unquestionably kill many young deer and they also not infrequently, it is said, attack and kill the adult deer. United States District Attorney Hon. H. A. Hall, of Pittsburgh, informs me that at St. Mary's, Elk county, where Messrs. Andrew Kaul and J. K. P. Hall own a game preserve of probably 650 acres, in which are confined a large number of deer, there is much trouble experienced from the wildcats disturbing the deer. Mr. Hall further states that small bands (probably families) of these carnivorous animals, in the winter when snow is on the ground, sometimes pursue, like dogs, full grown deer, which they run down and kill.

One of the few, in fact about the only species of game bird that is at all numerous, which the sportsman can go in quest of in this Commonwealth without almost continually coming in contact with trespass notices warning him to "keep off the grass" is the ruffed grouse or pheasant, and unfortunately the favorite haunts of this noble game bird are in localities where the wildcat loves to sneak, hide and depredate. The cautious and ravenous "cat" is passionately fond of grouse. He destroys them, both old and young, and also their eggs whenever an opportunity presents itself. He kills wild turkeys and sucks their eggs, it is affirmed, whenever a nest can be found. The number of small insectivorous and wild song birds that rest on the ground or in low bushes, which he destroys during the summer season, about the slashings and abandoned lumber camps is no doubt considerable.

Rabbits, squirrels, mice and skunks are also eaten by wildcats, and in the southern States Audubon says they visit sometimes "the dry beds of streams or brooks to pick up the catfish, etc., or crayfish and frogs that remain in the deep holes of the creeks during the drought of summer." The same authority states that "the wildcat is a great destroyer of eggs, and never finds a nest of grouse or partridge, wild turkey or other bird without sucking every egg in it."

About four years ago I spent ten days or two weeks in the winter in company with two hunters and trappers in Cameron and Elk counties. We secured nine wildcats, two with guns, and the remainder with steel traps, and on examining these animals I found that three of them were well filled with quills of the porcupine. This led me to infer that the wildcat did not hesitate to attack an animal capable of making a pretty vigorous defense.

Wildcats hunt both by day and night, but like the great majority of thieves and murderers they appear to select the darkness as the most auspicuous time to commit their deeds of violence. When a wildcat discovers a flock of wild turkeys, pheasants, or a rabbit running on the ground, he will follow them for some distance, and when he ascertains the direction in which they are going, will make a quick detour and, concealing himself behind a log, in the brush, or on a low branch of a tree, will hide and like an assassin, wait patiently until his prey comes within reach. I once, when hunting white rabbits in Cameron county, saw a wildcat run into a clump of laurel and lie in ambush until a rabbit which he had been chasing approach within springing distance. The rabbit ran up a narrow roadway and when within a few feet of the laurel bed suddenly stopped. Instantly the cat sprang upon it and seizing it in its mouth ran directly up the mountain side, where my companions shot him.

Romancing newspaper correspondents and hunters with fertile imaginations have been instrumental in creating an impression, which seems to be generally accepted by the common mass of people who are not acquainted with the true nature of wildcats, that these animals are daring, ferocious and always on the outlook to spill human gore, and will not hesitate an instant to attack human beings, no matter how big or ugly the latter may be. This, however, is not the case. Wildcats are cowardly and will flee from their pursuers, but if wounded and unable to escape, or if surprised in a place where they cannot get away and forced to give battle they will fight viciously and do great execution with their strong retractile claws and sharp teeth.

One of our correspondents in southwestern Pennsylvania writing on this topic says: "The catamount is a destructive and ferocious animal, for one attacked me one night when I was going home from courting a girl and treed me on a fence and I had to stay there till daylight." This surely is a unique case, and it possibly may be that wildcats are inclined to attack young men who are in love.

The wildcat usually makes its domicile or nest in a hollow tree or log. The nest is well lined with leaves, moss and lichens (Usnea barbata and its varieties), called commonly "hair moss." The nest is also sometimes found in rocky ledges and caves. From two to four young constitute a litter. It is stated that the young are brought forth about the middle of May. Wildcats may be caught in traps baited with rabbits, chickens, grouse or fresh meat. Their fur has very little commercial value.

The agitation of game laws and bounty or scalp acts at the last session of our Legislature has, it seems, been largely instrumental in arousing a wide spread interest in these subjects on the part of farmers, fruit growers, sportsmen and naturalists in almost every county of the State. Since the last Legislature adjourned there have been received at the office of the State Board about three hundred communications bearing on the economic relations of different wild animals, chief among which, so far as mammals are concerned, may be mentioned foxes, minks, weasels, wildcats, rabbits, skunks, woodchucks, muskrats and raccoons.

In view of the unusual interest manifested by our citizens on the bounty question and also in the habits in general of our common mammals, the writer prepared a circular soliciting information concerning the life histories of mammals attributed to the State. This circular, early in January of the present year, was distributed to farmers, fruit growers, naturalists, sportsmen, hunters and trappers in nearly every county of the Commonwealth.

At the present time, (October 1, 1894), about 350 answers, many of which are replete with valuable data, have been returned to our department.

The following questions in regard to the wildcat appear in said circular:

1. Please state whether the wild cat is found in your county, and whether it is rare, common or only tolerably common.
2. If wildcats occur in your neighborhood or county, state whether or not their depredations to game, poultry and small wild birds are of a serious character? Have you ever known wildcats to attack persons? If so, give full particulars.
3. Have you personal knowledge of one or more cases in which cattle, sheep or pigs have been killed or injured by wildcats? If so, give full particulars.
4. Have you personal knowledge of one or more cases in which wildcats have killed or injured deer, old or young, lambs or calves? If so, give full particulars.
5. Have you personal knowledge of the loss of turkeys, geese, ducks, chickens or pigeons from the attacks of predatory mammals? If so, how many, and what kinds were killed on each occasion? In each case mention the animal by which you suppose the mischief was done, and your reasons for this belief. Also mention the kinds of mammals which destroy the eggs of poultry, and give full particulars of cases which have come under your personal observation.
6. Do you favor the paying of bounties? If so, on what animals, in your opinion, should bounties be paid? Are you in favor of the bounty being paid by the counties in which the animals are slain, or that said bounties should be paid by the State?

In response to these interrogatories a considerable amount of instructive and interesting information is given on the succeeding pages from letters of the gentlemen who are credited with their observations:

GEORGE M. DAY, WAYNE COUNTY. Wildcats are not plenty this winter ('94). Eight have been killed that I have heard of. They are very destructive to rabbits, squirrels, ruffed grouse and other small game easily caught by them in winter. A large one was tracked by a hunter some years ago, and found to have eaten three rabbits and a ruffed grouse, all fresh, caught on same day. The skins of the rabbits were turned flesh side out on the snow, and the cat seemed to have room for more, as it was still hunting when the hunter gave up the chase. I have caught several of them in steel traps and saved one alive. With the help of two young men we drove it out of the woods, using a pitch-fork behind and a fish-pole attached to a trap chain ahead, as gentle persuaders to keep the peace, etc. It would hang back behind every bush at first, then a poke with the fork would send it, full spring, at my face the length of the chain. When out of the woods it sulked and lay on the snow, and was dragged to a small crate, lifted in, and a board placed on the box, completing the capture. I have never known one to attack any one, but their sharp claws and muscular forearms make them look like dangerous customers. The usual weight of wildcats is twelve to twenty-five pounds. One killed by S. Maloney near Beech Pond in 1892, weighed forty-two pounds. I caught one the same season which weighed about twenty-five pounds.

MESSRS. HERMAN AND OTTO BEHR, SULLIVAN COUNTY. Wildcats are common in this county. Think that they do quite an amount of damage to game, as they live entirely on flesh. Have seen where they caught black squirrels, white rabbits, porcupines and one deer. The deer mentioned was an old doe caught in the summer time; when found it was partly eaten and covered over with leaves. It was captured by the wildcat leaping on its back and biting it on the top of neck. A friend set a trap and caught the cat, which proved to be a large male. Have seen where one chased a fawn a distance of about one hundred rods, but gave up the pursuit when the deer ran up a steep hill. They occasionally enter a chicken coop and do some damage. Such visits, however, are rather rare. Do not think that they would attack a person unless cornered. We caught an old male wildcat in a bear pen in spring of 1889, which, during the six months that we kept it, became rather tame and listened to its name, "Jim." He would eat out of one's hand, if you trusted yourself, and would purr like a spinning wheel when we came around its cage.

We sent him to the "Zoo" in Philadelphia, and on calling there a year later we found him asleep in a cage with another smaller wildcat. On calling him by his name he got up and purred, apparently recognizing us after an absence of one year.

There is a very general opinion among hunters and other people that there are two different kinds of wildcats, a small and a large variety. We looked this up carefully and found only one kind, and came to the conclusion that whenever a half-grown lynx was caught it was called a wildcat, while a very large specimen was called a catamount.

Their fur is subject to change in color during the year. In summer it assumes a reddish tinge, while in the fall it becomes gray. We think one of the causes that wildcats are not more abundant is their habit of catching porcupines. Nearly all the wildcats we caught had quills in their bodies. One old male cat in particular was covered with sores caused by quills, and he had some all through his body, which would doubtless have been the cause of his death if left to himself. We do not favor the paying of bounties.

DR. J. E. CLEVELAND, BRADFORD COUNTY. Wildcats occasionally get into barn-yards and hen-roosts and destroy poultry in winters of deep snow, but they prey mostly on young grouse, quail, rabbits and small birds. A Mr. Krise, while returning from Blossburg to his home in Liberty township, sometime last November (1893), had to pass over Briar Hill, where there was a dense thicket of briars and brush on both sides of the highway, about dusk, a large catamount sprang upon the back of one of his horses and fastened its teeth into the horse's flesh. The man having no weapons with him, jumped from the wagon, seized the cat by its neck, tore it from the horse and by sheer strength choked it to death. The man's clothes were torn to shreds and his body and limbs were frightfully torn and lacerated.

Sometime in the sixties I was called to see a patient who lived on the head waters of the Tioga river in Ward township, Tioga county, Penna. When I arrived at the house, some of the boys of the family had just returned from the woods with a load of fire wood and reported that a "Painter" had killed a large deer in their sugar camp. As there was a fresh snow on the ground I investigated and found the tracks of the marauder along the body of a hemlock tree, which had been turned up by the roots. It had perched itself on the roots, and had remained there until the warmth of its body had melted away the snow. The deer, a two-year-old doe, had been feeding and had not suspected danger until too late to escape. The struggle was long and severe as shown by the upturned leaves and trodden down snow. The victor had partaken of a hearty meal from the neck and fore shoulder of the deer. I procured a steel fox trap and set it by the dead deer. On visiting the carcass the next day I found trap and drag gone. I followed the trail a few rods and found a large catamount with the trap to his hind leg. I could cite another instance where a wild-cat had killed a yearling deer." Am in favor of a bounty. Let each county pay its own bounty, **but only to its own citizens.**

JAMES THOMAS, CLEARFIELD COUNTY. Wildcats are very destructive to game, poultry and small wild birds. I know of two cases where they have been very bold. A man of my acquaintance was carrying a quarter of beef through a small strip of woods and a wildcat attacked him, tore his clothes and scratched him badly. Another man once got a ham, weighing about 20 pounds, and put it in a cave some 20 feet from the house and the next morning it was gone. I found it in a field, and seeing the tracks of a wildcat leading to and from the ham, I set a trap and caught the animal on the following night. It was about 4 feet 7 1-2 inches long and weighed 28 1-2 pounds. Am favorable to a bounty paid by the State.

A. W. COLEGROVE, McKEAN COUNTY. Wildcats are common in this county, and are very detrimental to game. Rabbits and pheasants are their principal subsistance. They will track a rabbit like a hound and have as good a nose for birds as a pointer. They usually kill more than the sportsman or pot-hunter. They will not attack a person unless cornered. I have killed many and but in one instance have I ever seen one show fight. I once had one cornered in the rocks, and after vainly trying to escape he turned upon me, when a shot between the eyes settled the battle. Wildcats will attack deer; I have killed deer that showed evidences of a fight with them. Red foxes are very numerous here and exceedingly destructive to game. They with the wildcats will exterminate game in a short time unless something is done to eradicate them. A large portion of this county consists of old slashings and bark peelings which make an ideal home for the cats and foxes. Since the county commissioners have refused to pay bounty on these predatory animals they have increased to a frightful extent. Their pelts alone are not a sufficient incentive for hunters to trap them. I am in favor of a bounty on foxes, wildcats, and also on certain kinds of hawks and owls; to be paid either by county or State. When the bounty law was in force, game such as rabbits and pheasants increased in proportion to the depletion of their four-footed and feathered enemies. Since then it has changed and unless there is an incentive for trappers the sportsman must soon hang up his gun and use his pointer for sausage.

A. KOCH, LYCOMING COUNTY. Wildcats have been rare in our neighborhood for more thon 40 years to hear of any depredations. Know of an instance where a boy, in winter, killed a large wildcat with a stone. Favor a bounty and think it should be paid by the county.

ZIBA SCOTT, LACKAWANNA COUNTY. The wildcat is one of the most destructive animals we have, both to the farmers and to game. Wildcats as a general thing do not trouble the farmer much in the winter time, when they retire to the forests and subsist principally on rabbits and pheasants. At this season of the year when snow is deep the pheasants live mainly on buds of the trees. When the pheasant has gotten its crop full of buds it often dives under the snow leaving a hole where it goes in. Here is where the wildcat gets in his deadly work on the unsuspecting grouse. He sneaks along until he gets within a bound of the place where the bird rests and with one leap he lands right over the hole where the bird sits, and nine times out of ten he gets the pheasant. I have seen hundreds of places in my time where pheasants have been caught in the manner just described. In the summer time when the leaves are out the wildcat is the source of much loss to the farmer. He then lurks about the grass and grainfields waiting for chickens, turkeys or other kinds of poultry, and sometimes he gets in amongst the sheep. About two years ago one of my neighbors, Mr. Joshua Doran, of Covington township, had three half-grown lambs killed by a cat.

TOWNSEND PRICE, MONROE COUNTY. Wildcats are quite numerous here, and their depredations to game and lambs certainly are of a serious character. Never knew them to attack persons and do not think they would unless they could not get away. I have personal knowledge of black bears killing cattle, sheep and pigs. Last year (1893) I had the misfortune to have between 30 and 40 sheep killed by bears. In the northern part of Monroe county near the line of Pike county there is a great deal of land which is useless except for grazing, as the timber has been cut for the bark and it burns over nearly every year. This is the place where the bears and wildcats have been doing their destructive work for the past few years. If there is not sufficient bounty placed on these animals to decrease them this pasture ground will have to be abandoned. I have known wildcats to bite lambs in the neck and then leave them lay. Favor bounty being paid by State.

J. C. HEYLER, TIOGA COUNTY. The greatest enemies the sportsman has to deal with are wildcats. They certainly destroy more ruffed grouse than anything in the woods. I have known them to scent grouse as much as eighty yards and catch them without any difficulty; and I have seen them capture grouse on nests. They catch and devour numerous other kinds of birds, and also kill small deer. I lose on an average from 3 to 7 lambs in a season by them. A wildcat sometime ago visited the home of one of my neighbors and in one night killed twenty-six chickens.

C. K. SOBER, CLINTON COUNTY. Wildcats destroy game and poultry. At Glen Union a family of these animals inhabited, until recently, a cavern in the mountains. In this place I found the bones and remains of fawns, poultry and other kinds of animals, which they had carried there to feed upon. I regard wildcats as the greatest enemies we have to game, such as pheasants, fawns and rabbits. Am in favor of a liberal bounty being placed on their worthless heads.

JOHN E. STOCKER, LUZERNE COUNTY. We have wildcats and catamounts and they are very detrimental to game. They occur most plentifully on the Wilkes-Barre mountains in the neighborhood of Triangle and Crystal lakes, and also on the North mountains, the latter a better suited place for them, as there more game, large and small, abounds. Favor bounty being paid by the county.

GEO. R. BOAK, CENTRE COUNTY. Wildcats are plentiful and very destructive to our game; are particularly bad about killing pheasants and they also destroy young deer in our game preserve. We introduced wild turkeys into our preserve and the wildcats and foxes destroyed both old and young, notwithstanding the fact that we tried faithfully to exterminate them through the aid of traps, poison and guns. Favor a bounty being paid by the county.

WM. B. BIGLER, M. D., YORK COUNTY. They are so rare in this county that little is known of their depredations. One killed a few years ago near Brogueville, was said to have killed and eaten a number of chickens.

DR. A. B. Mac CREA, COLUMBIA COUNTY. Wildcats are comparatively commin in some parts of the county, and no doubt destroy game to a considerable extent but they do not, it seems, disturb poultry very often.

W. B. K. JOHNSON, LEHIGH COUNTY. No wildcats in this county so far as I know. Possibly some may be present in the extreme northern part of Lehigh. I have travelled where the lynx was numerous; never knew of grown persons being attached, but have been told children were. They live on game, birds, small lambs and young pigs. I have helped to hunt them in Florida when lambs and pigs were thus killed.

N. W. MILLER, FAYETTE COUNTY. I think it would be right to put a bounty of say $2.00 on the wildcat, as this animal is very destructive to game. One wildcat will kill more game than six hunters in a season, as animals of this species hunt both night and day. I have seen large wild turkeys killed by them and have taken their track from the dead turkey, followed it and killed them. Have never known a wildcat to attack anyone; I have climbed trees and shaken them off to the dogs at different times.

H. T. FRANKENFIELD, MONROE COUNTY. Catamounts are quite numerous. They kill grouse, rabbits, and the young deer; I have known deer to be killed and partly eaten by wildcats and then covered with leaves. They rank with foxes in destroying poultry and game. I have never known them to attack persons unless wounded.

L. M. KARSTETTER, CLINTON COUNTY. Wildcats are very destructive to game such as fawns, turkeys, grouse and in fact birds of all kinds, and when pressed by hunger they visit the barnyard for any kind of prey they can capture. I have known wildcats on several occasions to catch and kill full grown deer. A bounty of not less than five dollars should be allowed.

R. S. STOVER, CENTRE COUNTY. Wildcats are the worst animals we have in this locality. A few years ago they killed two deer within a half-mile of my place; they destroy a great many young deer. I favor a bounty of at least four or five dollars and think it should be paid by the State.

H. K. MENSCH, LYCOMING COUNTY. Wildcats are few in this locality but they should not be allowed to exist as they possess no good traits and are capable of doing much mischief. A liberal bounty should be paid for their scalps.

CAPT. JOHN M. BUCKALEW, COLUMBIA COUNTY. When woods approach near a farm house wildcats or catamounts sometimes catch our chickens. They destroy the pheasant, quail, and almost anything that comes within reach, as rabbits, skunks, etc. Not dangerous to man but will fight when wounded or cornered. They are becoming rather rare here. Yes, am in favor of a bounty.

J. WARREN JACOBS, GREENE COUNTY. Wildcats are very rare, two have been recorded here during the past ten years.

JACOB B. MEIXEL, CUMBERLAND COUNTY. Wildcats do serious damage to pheasants, and I have known them to kill fox hounds in a chase. I favor a bounty to be paid by the county.

N. H. PARKER, MCKEAN COUNTY. The wildcat is too wild and wary to visit residences much, but occasionally takes a goose, chicken, or a turkey. Subsists mainly on game in the woods; rabbits and occasionally a young deer.

A. P. BREWER, McKEAN COUNTY. Wildcats are quite plentiful in some localities. They do a great deal of damage to pheasants and sometimes to chickens and turkeys. I never knew them to kill lambs.

MERION E. KEMERER, CARBON COUNTY. Wildcats are numerous in some parts of our county, especially in the Pine Swamp. They destroy all kinds of poultry and much game. I favor a liberal bounty for their destruction.

C. W. DICKINSON, McKEAN COUNTY. Wildcats are common here. They live chiefly on small game such as birds, partridges (grouse), rabbits and sometimes they attack larger game. I never knew one to attack a person and I have killed lots of them. I have seen where wild cats have killed a full grown deer. Three times in my life I have known of wild cats killing deer. I have known wild cats to kill sheep and poultry. I am in favor of placing a bounty of three dollars on the wildcat or catamount.

TUNIS SMITH, WAYNE COUNTY. Wildcats are plentiful. They destroy poultry but are most destructive to game and small wild birds. From personal observation have never known them to kill deer, but have no doubt that they do destroy many for while hunting deer I have seen where they have followed them for miles. Have never known them to kill sheep or lambs, but I do know of one instance where they took young pigs. I think a high bounty should be paid for their destruction because they are so derimental to game that if something is not done to exterminate them they will destroy nearly all the game in the woods such as pheasants and rabbits.

J. B. OVIATT, McKEAN COUNTY. Wildcats are tolerably common and very destructive to game. There can be no doubt but that they kill a good many deer, especially when the snow is deep and crusty. Have known them to kill lambs, fowls, etc. They would not attack a person unless in a place where they could not easily escape. I favor a bounty of not less than three or more than five dollars.

DR. C. E. GOLDSBOROUGH, ADAMS COUNTY. Wildcats are tolerably common in the mountains of this county. They kill all kinds of feathered game and rabbits, and are believed to destroy young deer. Am not in favor of a bounty being paid for any animal.

JASPER T. JENNINGS, SUSQUEHANNA COUNTY. Wildcats are very rare, however, one is now and then met with in the northern part of the county. Years ago when the species was numerous in this vicinity poultry and and lambs were often destroyed. I once cut down a large birch stub that was hollow at the top, where it had been broken off some forty feet from the ground, and within the hollow I found nearly half a bushel of bones and the skulls of rabbits, chipmunks, squirrels, etc., intermingled with a mass of sticks and rotten wood, where a wild cat had lately had its den or nest.

LINCOLN WELLS, BRADFORD COUNTY. Wildcats are present in some portions of our county. They do considerable damage to game of different kinds, especially grouse, and small wild birds. Favor a bounty to be paid by State.

ABRAHAM NEVELING , CLEARFIELD COUNTY. The depredations of wildcats are of serious character. They destroy turkeys and geese, as well as game. I have known a pair of wild cats to kill a fawn. Am in favor of a bounty being paid by the State.

J. P. SCHALL, NORTHAMPTON COUNTY. The wildcat is not numerous but occasionally one is shot; one of my neighbors killed one a few years ago that weighed 42 pounds. They generally live on game and will also carry off poultry.

J. ALBAUGH, FOREST COUNTY. Wildcats are present in this county and they are very destructive to poultry, lambs and young pigs.

SETH NELSON, Jr., CLINTON COUNTY. Wildcats are great destroyers of poultry and game. I have seen one of them kill a deer. Am in favor of a bounty of five dollars.

S. H. HASLET, FOREST COUNTY. Wild cats kill pheasants, rabbits, geese, chickens, lambs, fawns, etc.

THEODORE DAY, WAYNE COUNTY. Wildcats are destructive to poultry of largest size, small game and small lambs. The bounty of two dollars each should remain. A few years ago three (different ones) were seen in one day near the town of Dyberry.

DR. E. F. BONHAM, LUZERNE COUNTY. Wildcats are very destructive to game. There should be a bounty of two dollars for each one killed.

JOHN R. LEHMAN, HUNTINGDON COUNTY. Wildcats destroy game and small birds; am in favor of a bounty being paid by the State.

W. C. BABCOCK, TIOGA COUNTY. Wildcats destroy large quantities of game such as grouse and rabbits. They rarely venture in farming localities. Favor bounty being paid by the State.

A. P. YOUNG, COLUMBIA COUNTY. Wildcats are seldom seen or heard of in our agricultural districts.

JOSEPH P. McKELVEY, HUNTINGDON COUNTY. Wildcats are rather rare and theyseldom are seen in the farming districts.

ROBT. H. COLEMAN, LEBANON COUNTY. Wildcats are about exterminated in our hills.

DANIEL H. PERSHING, WESTMORELAND COUNTY. Wildcats are too scarce in this locality to do much injury.

HON. CHAS. LUHR, ELK COUNTY. Wildcats are present in considerable numbers in our woods; they destroy more fawns and young deer up to one year than any other wild animal. Favor bounty being paid by the State.

P. FRANK RANGLER, UNION COUNTY. Wildcats destroy game. I have killed several in this county but they are rather rare.

HON. N. B. CRITCHFIELD, SOMERSET COUNTY. Wildcats are found in the mountainous regions of our county, but their haunts are as far from human habitations as they can get.

ABNER FAGUE, LYCOMING COUNTY. Wildcats are found only in the mountains where in some sections they are rather plentiful. Have known them to kill young deer.

A. W. WRIGHT, HUNTINGDON COUNTY. Wildcats destroy poultry, game and small wild birds. Favor a bounty to be paid by the State.

G.C. BELL, WAYNE COUNTY. Wildcats kill poultry, game and small birds of different kinds.

B. ALEXANDER, CAMBRIA COUNTY. Wildcats cannot be said to be numerous in our county; know of one to have killed a deer. Am in favor of a bounty.

RANDALL BISBING, MONROE COUNTY. Wildcats are rather plentiful in some parts of our county, and some years they do much damage to poultry. Know of one instance where wild cats killed a lamb. Am in favor of a bounty.

CHAS. LOTT, WARREN COUNTY. Wildcats are not sufficiently numerous in my locality to do much damage to either poultry or game.

M. B. TRESCOTT, LUZERNE COUNTY. Wildcats are of frequent occurrence in some sections of our county.

GEORGE MILLER, YORK COUNTY. I do not think there are any wild cats in our county except perhaps in the South mountain.

E. E. BRILHART, INDIANA COUNTY. Wildcats are rather numerous in some parts of the county.

JEREMIAH PHILLIPPI, SOMERSET COUNTY. Wildcats or catamounts are frequently met with in some sections of our county. They destroy a great many wild turkeys and pheasants when hatching, and during hard winters they kill a good many deer. I think the State should pay a premium of five dollars on every wild cat.

J. H. VAN ETTEN, PIKE COUNTY In 1893 nineteen wild cats were killed in this county. Wildcats kill game and small wild birds; never heard of them killing poultry. I have, however, heard from a relable source that wild cats kill fawns, but I never heard of them killing lambs or calves.

BENJ. A. FILBERT, SCHUYLKILL COUNTY. The wildcat is a rather rare inhabitant of our mountainous districts.

C. W. PENNELL, WAYNE COUNTY. Wild cats are quite numerous and they destroy much poultry and game.

JOHN PERRY, McKEAN COUNTY. Wildcats are quite plentiful here. They live mostly on rabbits and partridges (ruffed grouse). I often hear of them catching lambs in the spring.

DR. F. J. WAGGENSELLER, SNYDER COUNTY. Wildcats are found to some extent, and where they are will do very serious damage to poultry, game, and small wild birds. Favor of bounty to be paid by the State.

P. D. REXFORD, TIOGA COUNTY. Wildcats are tolerably common in some parts of our county. They are very destructive to poultry and small wild birds. Am not in favor of paying bounties on any animals.

W. G. SARGENT, CRAWFORD COUNTY. Wildcats are very scarce in our county hence do little damage.

W. K. PARK, BRADFORD COUNTY. Wildcats are rather scarce in the section of the county where I reside; have only known two to have been killed in the last three or four years. Am in favor of bounty being given by the State.

M. B. LYMAN, SUSQUEHANNA COUNTY. Wildcats are very rare in this county.

W. F. WAGNER, CLEARFIELD COUNTY. Wildcats are tolerably common. They destroy game and birds. I favor a bounty to be paid by the State.

FRED L. KRAEMER, LYCOMING COUNTY. Wildcats are rare in many sections of this county. They destroy poultry and game.

A. K. PIERCE, CLINTON COUNTY. Wildcats only on rare occasions attack and kill the young of deer. I do not favor a bounty on any animal.

JAMES BEIHL, UNION COUNTY. Wildcats kill game and poultry. Am in favor of a bounty and think it should be paid by the State.

A STUDY OF STRAWBERRIES.

BY PROF. S. B. HEIGES, *Pomologist of the U. S. Department of Agriculture, and Fruit Culturis of the Board, Washington, D. C.*

Through the kindness of Mr. William Saunders, Horticulturist and Superintendent of Grounds, etc., of the Department of Agriculture, I have had the opportunity to study the various strawberries propagated for the purpose of obtaining plants for distribution.

The eastern plat of the experimental grounds is not well adapted for the cultivation of this most delicious berry, being of a cold, stiff and tenacious character.

In fact, the first planting was a total failure, but by plowing in July, seeding to turnips and plowing down the entire crop late in the fall the ground was very much improved for replanting the following spring.

Perhaps the most important fact learned by studying this plant is that certain varieties are much better adapted to succeed under adverse circumstances than others.

It illustrates the "survival of the fittest" not only in individual plants but also in kinds.

It may not be amiss to explain the construction of the flower of the strawberry before discussing varieties, as I find many persons are not in possession of this knowledge. A complete flower consists of four separate and distinct parts; the outer covering of the flower, generally green, is known as the calyx, each part of which is called a sepal; the part covered by the calyx, the colored part of the flower, white in the strawberry, is known as the corolla, each part of which is called a petal; within the corolla in a perfect flower, is a number of hair-like organs terminating in an enlargement; these are called stamens, the hair-like stem being called a filament and the enlargement the anther; occupying the central part of the flower is the pistil, the enlargement of which, through the pollen, a sulphur-like dust, secreted by the anthers produces the matured fruit.

In the strawberry the pistils are numerous, each producing one botanical fruit, containing a single seed; the so-called "berry" being the enlarged fleshy receptacle on which these true fruits (seeds) are borne.

This receptacle does not develop unless a large proportion of the pistils are fertilized. The stamens and pistils, therefore, are the organs essential to fructification.

The blossoms of some varieties of strawberries (and of other fruits) are devoid of stamens and are called pistillate.

It is evident that these varieties must be fertilized by pollen from the stamens of another variety possessed of these organs, grown in the immediate neighborhood, hence the custom of planting an occasional row of staminate varieties amongst pistillate ones.

Varieties having stamens and pistils in the same flower are called perfect ones.

I am led to believe, after many years of the closest observation and most carefur experiment, that our object should be to develop perfect flowered varieties and not to depend upon pistillate ones.

A few days difference in the time of blossoming of the pistillate and staminate varieties grown together for the purpose of fertilization, may make all the difference between profit and loss in our cultivation.

Good strong staminate varieties with an abundance of pollen granules of strong vitality produced by the stamens should be the aim in the production of new sorts.

I admit that many of our most profitable varieties are pistillate ones, but if the same study and labor had been devoted to producing perfect flowered ones, strawberry culture would be far in advance of its present status.

But my object in writing this paper is to give a fair and impartial history of the varieties upon our grounds during the past season, embracing the following points:—earliness, size, quality, productiveness, length of fruiting season, vitality, etc.

Earliness.

Each variety was credited—not when the first ripe berry could be found—but when a sufficient number of berries were ripe to make a picking profitable. To be more explicit, as early a date as possible was chosen when a grower would have put his pickers into the field for marketing that variety.

Each variety was thus placed on the same basis. Of all the varieties herein described the Ella was the earliest.

Of the Ella, staminate, a profitable picking could have been made May 9th.

Of the Michel (Early, staminate, a profitable picking could have been made May 15th.

Of Hoffman, staminate, a profitable picking could have been made May 15th.

Of Lovett (Early), staminate, a profitable picking could have been made May 18th.

Of Shuster (Gem), staminate, a profitable picking could have been made May 18th.

Of Lady Rusk, pistillate, a profitable picking could have been made May 18th.

Of Australian Crimson, staminate, a profitable picking could have been made May 18th.

Of Middlefield, pistillate, a profitable picking could have been made May 18th.

Of Stevens, staminate, a profitable picking could have been made May 18th.

Of Enhance, staminate, a profitable picking could have been made May 18th.

Of Crescent, pistillate, a profitable picking could have been made May 18th.

Of Parry, staminate, a profitable picking could have been made May 18th.

Of Alabama, staminate, a profitable picking could have been made May 18th.

Of Mrs. Cleveland, pistillate, a profitable picking could have been made May 18th.

Of Iowa (Beauty), staminate, a profitable picking could have been made May 18th.

Of Waldron, pistillate, a profitable picking could have been made May 19th.

Of Oregon (Everbearing), staminate, a profitable picking could have been made May 19th.

Of Beebe, staminate, a profitable picking could have been made May 24th.

Of Parker Earle, staminate, a profitable picking could have been made May 24th.

Of Jucunda Improved, staminate, a profitable picking could have been made May 26th.

Of Standard, staminate, a profitable picking could have been made May 26th.

Of Eureka, pistillate, a profitable picking could have been made May 26th.

Of Yale, staminate, a profitable picking could have been made May 26th.

Of Edgar Queen, pistillate, a profitable picking could have been made May 27th.

Summary.

Early varieties,	3
Medium early,	14
Late,	7

Note.—All of these varieties might vary a day or more under different conditions and circumstances, but this record may be relied on for general purposes.

Size.

Of all the varieties the Iowa Beauty produced not only the largest berries, but the crop was uniformly large and maintained its size until the very last picking.

Shuster (Gem), Eureka, Mrs. Cleveland, Parry, and Yale produced berries next largest in size but ran down after a very few pickings.

Quality.

Iowa (Beauty) ranked first in quality, being a very dark fleshed berry, devoid of core, and of rich vinous sprightliness.

Lady Rusk, Parry, Enhance, Australian Crimson, Mrs. Cleveland, Parker Earle and Yale ranked from good to very good.

Productiveness.

Ella, Michel, (Early), Crescent, Lovett (Early), Iowa Beauty, Parker Earle, Eureka, Mrs. Cleveland, Enhance, and Yale were the most productive varieties. A single picking about exhausted the Stevens. The Oregon Everbearing produced but a few berries at a time and had the shortest season of any variety except the Stevens.

Length of Fruiting Season.

Ella, Michel (Early), Crescent, Shuster Gem, Parker Earle, Eureka, Iowa (Beauty), Parry and Lovet (Early), could have been picked profitably for the greatest length of time.

Vitality.

Owing to the excessive drouth many of the varieties are poorly prepared to go into "winter quarters," although the eastern plat was frequently saturated with water by allowing the hose to run day and night.

Under more favorable natural conditions different results might have been reached and this report might have been considerably modified, as the strawberry is a variable fruit, changing time of ripening, etc., in different seasons and on different soils and exposures.

The western plat consisted of a better quality of soil, in finer tilth, and in every way better adapted to the growth of the strawberry but lacked the means of irrigation possessed by the eastern plat.

A careful examination made October 22d enables me to report upon the vitality of the varieties on that date.

They all had been trimmed last fall to the uniform width of one foot by the careful removal of plants for distribution and presented a promising appearance in the spring.

The grounds were frequently and carefully cultivated during the season, to encourage the growth of new plants.

From the width of one foot the following results were reached during the season and carefully noted upon the above mentioned date, October 22, 1894.

Ella. Average width of row, three feet, a perfect mass, very little affected by blight; young plants vigorous; plants in middle of row nine inches high. Same condition in western plat.

Michel (Early). Average width of row, two and one-half feet; very few parent plants lost; young plants large and vigorous.

Hoffman. Average width of row, one and one-half feet; plants badly blighted; no parent plants lost.

Lovett (Early). No more plants formed than to make the row one foot wide; lost as many parent plants as new ones formed; same condition on the west plat.

Shuster (Gem). Made plenty of plants; will fill up a solid row one ane one-half feet wide; very little blight. On west plat held its own. No parent plants lost; healthy; very few young plants formed.

Lady Rusk. Parent plants and new ones would not make a half stand one foot wide; old plants more than one-half dead; very few new ones formed.

Middlefield. Lost many parent plants; formed few new ones; not more than 75 per cent. of a stand.

Stevens. Average width of the row thirty-four inches. A perfect mat, ground invisible; little blight.

Enhance. Just held its own.

Note.—The Enhance is a remarkably firm berry; must prove an excellent shipper.

Crescent. Just about held its own.

Parry. Almost a total wreck.

Alabama. Width of row three feet; very little blight.

Mrs. Cleveland. Average width of row, two feet; no parent plants lost.

Iowa (Beauty.) A perfect mat of plants; average width of row two feet.

Waldron. Average width of row two and one-half feet; pretty badly blighted; made its plants early in the season.

Oregon Everbearing. Has not held its own; many old plants dead; very few ones formed.

Beebe. No loss of old plants; little blight; very few new plants formed; papery leaf and wiry runner, very distinct foliage.

Parker Earle. Just held its own; new plants formed robust; old plants healthy appearance.

Jucunda Improved. Lost few parent plants; just held its own.

Standard. Formed good healthy plants; scarcely a sign of blight.

Eureka. Row one and one-half feet wide, plants considerably blighted; no parent plants lost.

Yale. Just about held its own; new plants healthy; parent plants earliest to blight of any variety during the season.

Edgar Queen. Just held its own.

Several parties interested in the cultivation of strawberries have pronounced Michel (Early) and Ella identical. Of the origin of the Ella I only know that Mr. Saunders received it, from a source now unknown, labeled "Ella" and under that name he has propagated and disseminated it.

After a very thorough study I am satisfied they are distinct, the Ella being earlier, more productive and different in other points, as already described in this paper and in the following, to wit:

May 9th. Nine specimens of the Michel were compared with a similar number of the Ella. Of the Michel the sepals were more numerous; average 13 2-3; of the Ella the average was 13.

May 14th. Fifteen specimens of the Michel were compared with an equal number of the Ella. Of the Michel the average number of sepals was 13 4-5; of the Ella, 12 4-5.

The Michel has more coxcomb specimens and these have as high as 18 sepals. The Ella runs more uniform in shape and has very few coxcomb specimens; these specmens have fewer sepals, 15 being the highest number found. The Michel in most specimens has flesh of a darker color; this color penetrates nearly to the center of the berry.

The Ella has a white core surrounded by a quite distinct margin of salmon colored flesh.

The Michel is a little less firm than the Ella and is distinctly sweeter in berries of the same ripeness.

Note.—A peculiarity of the Shuster (Gem) is worthy of mention. Of the foliage formed early in the season, at least ten per cent. of the leaves consisted of four and five leaflets, a peculiarity noticed in no other variety.

THE PROTECTION OF FOOD PRODUCTS DURING TRANSPORTATION.

BY MAJ. FRANK RIDGWAY, *Meteorologist of the Board, Harrisburg, Pa.*

The Weather Bureau has issued a circular in relation to injury to food products during transportation, and the precautions which should be taken to protect them, from which the following is taken, and is here given for the benefit of Pennsylvania shippers:

Many of the precautions in packing that may keep out the cold would also keep in the heat, and there is really more danger, in some instances, from heating, by process of decomposition, than from cold.

In shipping car loads of bananas, a man is usually sent in charge to open and close the ventilators.

Precautions taken in shipping are papering, packing in straw or saw-dust, boxing, barreling with paper lining, shipping in paper-lined cars, refrigerator cars, and cars heated by steam, stoves and salamanders.

During cold weather oysters and clams should be shipped in tight barrels lined with paper.

In shipping perishable goods, it is well to cover them with two sheets of heavy paper, weighing about one and one-fourth pounds each.

Bananas should be put in a paper bag and a heavy canvas bag and then covered with salt hay, but when put in automatic heaters the fruit is packed only in salt hay.

In packing articles in a car for shipment, potatoes are packed in straw, bulkheaded back, center of car left empty, and car filled as high as double lining, while some of the cars have a double bottom.

French mustard and aqua ammonia are packed in sawdust and securely boxed, being careful to allow the sawdust to form a layer between the articles and the side of the box.

Eggs are packed in crates with separate pasteboard divisions with a layer and a cover of oat chaff.

Quinces, apples, onions and pears are packed in barrels, each layer of barrels covered and resting on straw.

Tomatoes, lemons and oranges are packed in crates, each layer of crates in the car is covered and rests upon straw, usually bulkheaded back from the door and car full.

Shrubs and fruit trees are laid on straw, covered with it on all sides, and car packed full.

Flowers are packed in moss and car filled.

Flowers, shrubs and trees should have their roots carefully packed in straw and the roots placed together in two or three piles, so as to protect them; if the roots are killed they are of a uniform black, if only injured by frost the root is pinkish in color just below the outer covering, and if sound they are of a uniform white. Even if of a dark pink color no damage need result if the frost is gradually thawed out by the trees being left in the closed car for four or five days, or else put the roots well down in the soil in a horizontal position and thaw out gradually.

Extra precautions are taken with trees, etc., when passing over mountains, and no shipments are made when the temperature is likely to be zero any where in the higher regions.

Cars containing perishable goods are sometimes, when a north wind is blowing on the prairie, covered with canvas on the north side.

Oranges shipped from Florida to points as far north as Minnesota are started in ventilator cars, which are changed at Nashville to air-tight refrigerator cars, the ventilators of which are kept open, provided the temperature remains above thirty-two degrees, until arrival at St. Louis, from which point the ventilators are closed and the cars made air-tight.

In winter time refrigerator cars are used without ice in forwarding goods from the Pacific coast, and in passing through cold belts or stretches of country the hatches are closed, and the cars being lined and with padded doors, the shipment is protected against the outside temperature; but in passing through warmer climates the ventilators of the cars are opened in order to prevent the perishable goods from heating and decaying.

Manure is largely used to protect perishable goods, the bottom of the car being thickly covered with it, and in some cases it is put on top of the goods.

To protect goods shipped in an ordinary car, the sides of the car should be protected by heavy paper tacked to the wall and by the addition of an inner board wall a few inches distant from the other one. A car thus equipped and packed with produce surrounded by straw will retain sufficient heat to prevent injury for twenty-four hours, the average air temperature of all parts of the car being at least twelve degrees higher than that of the outside air.

In shipping potatoes, when the temperature is twelve degrees, or more, below freezing, the rule is to line the barrels with thick paper, and at extremely low temperatures, as a matter of extra precaution, the barrels are covered over the outside with the same kind of paper, which is considered the best known protection from frost.

All products sent loose in a car are packed in straw on all sides, paying particular attention to the packing around doors, and to see that the car is full.

Certain classes of goods, embracing peaches, melons and grapes, are taken by some railroads in no other way.

To transport potatoes, place an extra floor and sides in the car, leaving an air space of from four to six inches, then place a stove in the center.

Oranges loaded in ventilated or common cars should be transferred to refrigerator cars when the temperature reaches ten degrees above zero. When oranges are transferred to refrigerator cars, or if loaded in ventilated refrigerators, and the ventilation is closed, the car must be iced sufficiently to prevent heating.

Ventilators on cars containing bananas, lemons and other delicate fruits must be closed at a temperature of forty degrees.

Cars are warmed by steam from the locomotive when in motion, and by stoves when steam is not available.

Cars after being loaded are carefully inspected as to temperature within, their destination considered, and if the weather is exceedingly cold, or is liable to be, the car is often accompanied by an attendant; otherwise it is inspected from time to time on the road.

Oranges in transit, with a falling temperature, the ventilators should be closed when the thermometer reaches twenty degrees, and with a rising temperature the ventilators should be opened when twenty-eight degrees is reached. For lemons the minimum is thirty-five degrees for opening and closing the ventilators, and for bananas forty-five degrees for opening or closing.

Lined cars, that is, cars lined with tongued and grooved boards on the sides and ends, leaving an air space of about four inches, are considered the best by heavy shippers of potatoes, as they can be heated by an ordinary stove, and will stand a temperature outside of twenty degrees below zero, when a man is in charge to keep up the fires.

ENEMIES OF THE HONEY BEE.

By Dr. George G. Groff, *Apiarist of the Board, Lewisburg, Pa.*

The honey bee has a number of natural enemies, some of which, under favorable conditions, are able to create considerable havoc in the apiary. These enemies may be grouped into three classes for the purposes of this paper. 1, Devastating; 2, Annoying; 3, Foreign.

1. The enemies of the first-class which the writer has observed in Pennsylvania, are robber bees, bee moths, mice, toads, and the king-bird. Whenever the weather is warm enough for bees to fly, and at the same time, there is an absence of honey-bearing flowers, weak colonies are liable to be robbed of all their stores, and the colony destroyed by "robbers." Strong colonies are never attacked, and it is said that Italian bees are less frequently robbed than the common black bees.

Robbing is often induced by carelessly leaving honey or sugar exposed near the hives. After this is eaten up, the bees are almost always sure to search for a weak colony which they may rob. Robbing is also promoted by keeping hives open too long when examining them. The robber-bees seem to smell the honey and to begin an attack at once. If robbing is not promptly broken up, a whole apiary may become demoralized, and all legitimate work be given up for the more fascinating labors of pirates and freebooters.

Robbing is commonly to be controled by making the aperature to the hive attacked so small that but one or two bees can pass at once. This is easily done by closingg the entrance by blocks of wood. Sometimes however, it may be necessary to carry an attacked conony into a celler, where it should remain in the dark for several days or a week. When bees are feed, it is best to do the work after night, for they are then least disturbed. It is said that when a colony discovers that all their stores are about to be stolen, they join the robber colony, going home with them, and thus preserving their lives, if not the independent existence of their commonwealth. About the entrance to a bee-hive one always observes, in warm weather, a number of sentinels. These are to guard against robbers. It is said that they challenge every bee desiring to enter the hive, which comes unloaded. All bees belonging to the colony are admitted however, but only strange bees which come laden with honey find admittance.

The Bee Moth.

The brownish "worms" sometimes found in bee hives are the young of a moth called the bee-moth. These moths are often seen in the evening hovering about the entrance to the hives. At a favorable moment some eggs may be deposited in a crevice under the hive or between it and the bottom board. The eggs soon hatch into worms. To protect themselves, the worms, construct tunnels of silk in the combs, in which they live until they are ready to go into the pupa, or quescent state, which precedes their hatching into the moth. When the worms have gotten their full growth, they find a secure spot, generally a protected crevice in the hive, in which they spin very strong cocoons, of a dirty white color, and a little less than an inch in length. In these cocoons the worms lie developing into moths for a variable period, depending upon the temperature of the air.

Mice.

When bees are wintered in the cellar, or when packed in chaff, they are liable to be much annoyed by mice. These animals will enter hives, build their nests there, and consume the combs, even those on which bees are clustered. The annoyance is so considerable as to cause the loss of some colonies. The only remedy to suggest, is to so close hives that these pests cannot gain an entrance.

Toads.

Toads like to devour bees filled with good honey. When hives are placed in the ground, toads will almost always be discovered under them in holes in the ground. At dusk, and at night, the toad approaches the entrance to the hive and catches belated bees, or these which venture outside the hive to spend the evening in the warm summer air. The injury done by toads is probably small. Toads have been dissected with their throats full of bee stings, but this did not seem to annoy the reptile.

The King Bird.

The king bird, called also the bee-martin is fond of honey bees, Some think that it catches only drones, but there is no good reason for believing that it is any respecter of persons when it gets among flying bees. The king bird takes the bees on the wing, and at times, seems to be destroying them in considerable numbers, at which time it is customary for aspiarists to shoot them.

Professer Cook speaks of a bee killer, a predacious two-winged fly, as causing trouble in apiaries in the south. I have not seen it in Pennsylvania. The same author also mentions the bee hawk (mosquito hawk), an insect closely related to the dragon flies, as causing some trouble in the southern states. Wasps are also claimed at times to commit destructive warfare upon bees. The writer has often seen them about the hives, but has never seen one molest a bee.

2. Annoying Enemies.

In this class we place the spider, the ants, the bumble bees and the wasps. Spiders seem remarkably fond of spinning their webs in and about hives. Their webs seem strong enough to annoy the bees, though not strong enough to destroy many of them. Webs are observed about the entrance to hives, so as to be a great annoyance to the bees. All that it seems necessary to suggest here is to brush the webs away.

Ants like to get on top of the combs, probably for warmth. They have not been observed taking honey. In considerable numbers they seem to annoy the bees, but probably do no great harm.

Wasps and bumble bees are often seen at the entrance to hives, making efforts to enter, but are continually challenged by the sentinels. They are probably after honey. They are merely an annoyance to the bees, and do little if any harm.

Foreign Enemies.

In Italy and the south of Europe, there exists upon bees a large spider-like louse. This has repeatedly been introduced into America upon imported bees, but so far has caused no trouble. The only danger from it is, that in some portions of the south, it may find a congenial climate and surroundings and multiply so as to become a serious pest.

The chimney swallow in Europe is said to feed upon bees. In this country the chimney swallows are entirely free from any such bad habit. The English sparrow has been accused of eating bees, but the observation has not been confirmed in Pennsylvania.

FERTILIZER VALUATIONS.

By Dr. Wm. Frear, *Chemist of the Board, State College, Pa.*

Hon. Thos. J. Edge, Secretary, Board of Agriculture, Harrisburg, Pa.:

Dear Sir: In accordance with your request I submit the folllowing recommendations with reference to the Fertilizer Valuations:

Before presenting the recommendations themselves, permit me to direct attention to the general principles upon which they are based.

The several elements entering into the final price paid by the consumer of fertilizers may be conveniently grouped as follows:

1. The wholesale cost of the ingredients.

2. The jobbers' gross profit on the sale of the ingredients; this in-

cludes office expenses, advertising, losses, etc.; for the purposes of the present computation it may be assumed that the sum of this gross profit and the wholesale cost of the ingredients is equivalent to the retail price of the single ingredients near the wholesale markets in ton lots of original packages for cash.

3. The expense and profit of mixing: This item applies only to complete fertilizers, rock and potash, and ammoniated rock; not to dissolved or ground bone, or to dissolved rock.
4. The expense and profit of bagging.
5. Agents' commission: This item includes not only the commission proper, but every advance in price due to the sale of the goods through an agent in small quantities on time, rather than directly to the consumer in ton lots for cash.
6. Freight from the wholesale market to the point of delivery.

It is the chief purpose of a system of valuation, while incidentally informing all interested as to certain broad phases of the trade, to give for goods of a given composition its average retail value under the usual conditions of sale, establishing a standard with which the price actually asked may be compared. To afford such comparison, it is obvious that any satisfactory method of valuation must take into consideration each of the above mentioned elements of final cost.

It may be emphasized, at this point, that neither the local nor the general agricultural usefulness of the fertilizer has any direct connection whatever with this valuation.

1. In determining the wholesale cost of the ingredients, i. e., the price which the mixer must pay to the manufacturer for them, the wholesale prices of the New York market, as shown by standard trade journals, brokers' circulars, etc., are used. The data taken as the basis of the proposed schedule for 1894-5 are the average wholesale prices from September 1, 1893, to May 1, 1894.

WHOLESALE PRICES OF FERTILIZER INGREDIENTS.

(New York Market.)

September 1, 1893, to May 1, 1894.

Ammonium sulfate,	$3.504	per cwt.
Nitrate of soda,	1.935	" "
Dried blood, high grade,	2.533	per unit.
Dried blood, low grade,	2.404	" "
Azotin,	2.546	" "
Concentrated tankage,	2.516	" "
Ground bone,	22.44	per ton.
Bone meal,	23.59	" "
Fish guano, dried,	25.00	" "
Fish guano, acidulated,	15.00	" "
Cotton-seed meal,	27.00	" "
Refuse bone-black,	19.00	" "
Ground phosphate rock,	8.43	" "
Acid phosphate (14% available),	0.61	per unit.
Double manure salts,	1.158	per cwt.
Sulphate of potash (90%),	2.141	" "
Muriate of potash (80%),	1.877	" "
Kainit,	9.42	per ton.

The prices of potash salts are f. o. b. ship in New York harbor; to place them on a par with goods in the warehouse of the manufacturer, an allowance of $3.00 per ton must be made to cover customs fees, lighterage, insurance, and warehouse expenses.

2. The jobbers' gross profit on the sale of ingredients, judging from the accumulated records of recent retail cash purchases of single ingredients, averages 20% of the average wholesale cost. To permit a ready computation of the probable expense of any combination of ingredients, if bought separately for cash and mixed at home, the New England, New Jersey and New York fertilizer controls have adopted as the unit of valuation a retail pound-rate for the valuable constituents derived from the several ingredients. The average composition of each ingredient being known, the wholesale pound-rate for each constituent for any given time, is readily computed; the retail pound-rate used in the fertilizer valuations of these States is gotten by adding 20% to the wholesale pound-rate. For the sake of uniformity, this schedule of rates is recommended for use in Pennsylvania. But at two points, local retail conditions make it advisable to vary therefrom.

(a) Owing to the comparatively insignificant quantities of rock goods used in their territory, these States make no distinction in the rates for phosphoric acid, whether derived from rock or bone. In Pennsylvania, there is a very large sale of rock phosphates, so that it is necessary to make a rate for them; the New York wholesale prices being used as for all other ingredients, save one.

(b) The computed values of ground bone obtained by use of the above schedule are far in excess of the actual selling price in Pennsylvania. Other things being equal, the retail cash price of ground bone in this State is only 75% of the retail cash price computed by that schedule. In the schedule proposed for use during the coming year in Pennsylvania, the values for the constituents in the several grades of bone are, therefore, reduced correspondingly.

For the sake of comparison, the proposed schedule for 1894-5, the schedule used in this State, 1889-1894, and those now in use in several neighboring States are given. All include the wholesale cost plus the jobbers' gross profit, but that of Maryland also includes an allowance for mixing and bagging, and those of Kentucky, Indiana and Michigan include allowances for mixing, bagging and freight.

Schedules of Valuation in Pennsylvania and Neighboring States.

	Pennsylvania schedule, 1894.	Pennsylvania schedule, 1889-1894.	Massachusetts, Rhode Island, Connecticut, New Jersey and New York, 1894.	Maryland, 1894.	Kentucky, 1894.	Indiana and Michigan.
	Cts. per lb.					
Nitrogen in ammonia salts,	19	19	19	20	20	22
in nitrates,	14½	17	14½	20	20	22
in dry and fine ground fish, meat and blood and in *mixed fertilizers*,	18½	19	18½	20	20	22
in cotton seed meal and castor pomace,	15	15	15	20	20	22
in fine bone and tankage,	12½	16½	15½	14	20	20
in fine medium bone and tankage,	11	13	15	12	20	20
in medium bone and tankage,	9	10½	13	10	20	20
in coarse bone and tankage,	5½	8½	7	8	20	20
in hair, horn shavings and coarse fish scrap,	7	8	7	....	....	....
Phosphoric acid, soluble in water, in bone fertilizers	6	8	6	6	8	8
soluble in water, in rock fertilizers,	4	8	6	6	8	8
soluble in ammonium citrate,* in bone fertilizers,	5½	7½	5½	6	8	8
soluble in ammonium citrate, in rock fertilizers,	3½	7½	5½	6	8	8
insoluble in ammonium citrate,	2	†3	2	†3	2½	8
in fine bone and tankage,	4	7	5½	5	4½	‡
in fine medium bone and tankage,	3½	6	4½	4		
in medium bone and tankage,	2½	5	3	3	4	‡
in coarse bone and tankage,	2	4	2	2		
in fine ground fish, cotton seed meal, castor pomace and wood ashes,	5	7	5	....	....	....
Potash in high grade sulfate and in forms free from muriate (or chlorid),	5½	6	5½	6	7½	6
as muriate	4½	4½	4½	6	6	6

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* Neutral solution of 1.09 sp. gr. using 100 c.c. for 30 minutes at 65° C.

† In rock goods, two cents.

‡ Are analyzed like dissolved bone.

3-4. It is recommended that $1.00 each be allowed for mixing and bagging.

5. The items included under the head of 'commission' constitute a quite variable element in the selling price of fertilizers. By use of the average selling prices, less the average freights, for the several classes of fertilizers, other than ground bone, chiefly sold on the Pennsylvania retail market, and the data already given, it is found that the following per cent. advances over the cash retail value of the goods mixed and bagged f. o. b. at factory, were severally asked as commission during the spring of 1894.

	No. of Samples.	*Per Cent. Commission.*
Complete fertilizers,	334	20
Rock and potash,	27	42
Dissolved bone,	17	15
Dissolved rock,	64	17

Taking everything into consideration, 20% advance more nearly covers these items of cost than any other convenient figure, and is recommended for use.

6. To cover the cost of transportation from the wholesale market, an allowance of $2.00 per ton is recommended. The average cost per

ton for freight in carload lots, from New York or Baltimore to Harrisburg, is $1.68; to Pittsburgh, $2.40; to Warren, $2.60. The rate is ample to cover the cost of transport for the mean distance over which the fertilizers sold in Pennsylvania are carried.

Assuming the correctness of the above data, it simply remains to determine the amounts of the several valuable constituents and the kind of ingredients used to supply them, in order to make a very close valuation. Unfortunately, a perfect quantitative determination of the ingredients used to supply given constituents is not yet possible for all ingredients; and even where it is perfectly feasible, your honorable body has not deemed it expedient to undertake such refinement at the expense of the quantity of work now performed.

These facts require that certain arbitrary assumptions be made, before the computation can be undertaken. The rules of our practice in the past should be continued. They are as follows:

Potash in excess of that equivalent to the chlorin present will be valued as sulfate, and the remainder as muriate.

Nitrogen in mixed fertilizers will be valued as derived from the best sources of organic nitrogen, unless clear evidence to the contrary is obtained.

Phosphoric acid in mixed fertilizers is valued at bone phosphate prices, unless clearly found to be derived from rock phosphate.

Ground bone is sifted into four grades of the following fineness: Fine, less than one-fiftieth inch; fine medium, less than one twenty-fifth inch; medium, less than one-twelfth inch; and coarse, over one-twelfth inch.

The computation of commercial values is made as follows: Multiply the percentages of the several valuable constituents by 20 to get their several quantities in pounds per ton; multiply these several quantities by their appropriate retail pound-rates and add the products; the sum is the retail cash value of the ingredients in a ton; by adding to this sum the allowance for bagging, and that for mixing when it applies, the retail cash value of the bagged, mixed fertilizer is obtained; a further addition of 20% of the sum last obtained and of the freight allowance, will give the final commercial value. An illustration may make the method clearer; the following is a computation for dissolved rock:

Phosphoric acid:

Phosphoric acid.	*Composition per cent.*	*Pounds per ton.*	*Pound rate.*	*Value of ingredients.*
Soluble, ...	11.50	230	4c	$9.20
Reverted, ...	2.50	50	3½c	1.75
Insoluble, ...	1.00	20	2	.40

Retail cash value of ingredients, ...	$11.35
Bagging, ...	1.00
Cash value of goods ready for shipment, ...	$12.35
Commission (20 per cent.), ...	2.47
Freight, ...	2.00
Commercial value, ...	$16.82

To gain a clear idea of the closeness of relation between these average selling prices, computations have been made of the commercial values of the several classes of fertilizers sold last spring by the schedule above proposed, the old Pennsylvania schedule (1889-1894), the New England and the Maryland schedules. It should be recalled that under the Pennsylvania schedule of 1889-1894, neither dissolved rock nor ground bone received any allowance for bagging, while dissolved bone received not only this, but an allowance for mixing as well; while no allowance for freight was made in any case.

The average percentage of valuable constituents in the several classes of fertilizers sold in Pennsylvania last spring were:

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of samples analyzed, ...	334	27	17	64	75
Percentage composition.					
Phosphoric acid—Soluble, ...	5.48	6.95	7.02	9.90	. . . .
Reverted, ...	3.34	4.25	4.08	4.31	. . . .
Insoluble, ...	2.77	1.91	2.62	2.12	22.79
Potash, ...	3.47	2.48	. . . .	. . . .	. . . .
Nitrogen, ...	1.77	. . . .	1.92	. . . .	3.28
Mechanical analysis.					
Fine, ...	. . . .	. . . .	. . . .	. . . .	43
Fine-medium, ...	. . . .	. . . .	. . . .	. . . .	24
Medium, ...	. . . .	. . . .	. . . .	. . . .	22
Coarse, ...	. . . .	. . . .	. . . .	. . . .	11

The valuations of goods of the average compositions thus shown are, by the several schedules:

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of samples included, ...	334	27	17	64	75
Average selling price, ...	$29.54	$21.22	$27.22	$16.98	$29.54
Valuation.					
By proposed schedule, ...	29.58	18.26	28.32	17.32	29.72
By the old Pa. schedule,*	28.84	18.95	30.06	23.13	36.09
By the N. E. schedule,†	20.96	16.03	20.93	17.45	28.92
By the Maryland schedule,*	23.41	17.20	22.42	17.88	26.00

* Includes no allowance for freight or commission.

† Includes no allowance for mixing, bagging, freight or commission.

The difference between the average selling prices and the average commercial values computed by the proposed schedule are:

For complete fertilizers, ...	+$0.04
For rock and potash, ...	— 2.96
For dissolved bone, ...	+ 1.10
For dissolved rock, ...	+ 0.34
For ground bone, ...	+ 0.18

Any marked fluctuations in the wholesale market must shortly affect retail values of mixed goods; but there may be reasonable doubt as to the economy of purchase of any fertilizer whose selling price during the present fertilizer year exceeds by more than $2 to $3 the commercial value computed according to the foregoing schedule.

VANISHING INDUSTRIES.

By Prof. J. T. ROTHROCK, *State Forestry Commissioner, West Chester, Pa.*

Industry, if not wealth, is at least a source of wealth, and the obliteration of any one of these productive sources from the limits of a State is a loss of power and importance to the Commonwealth, unless its place be taken by another of equal importance. It is no solution to the problem to say that it has gone elsewhere. The fact remains that having gone from us and left no substitute, we are the poorer. To illustrate, we will instance the tanning industry, which to-day, directly or indirectly, distributes probably no less than ten millions of dollars among the people of Pennsylvania. The time is not remote when it will have become practically extinct in Pennsylvania; but the manufacture of leather will go on elsewhere. The vast resources of the tropics will be opened up. The mangrove swamps and the quebracho forests will furnish substitutes for the hemlock and oak bark. But this is the point for us to remember: We will not have the industry here to distribute a golden crop among ourselves.

There are deserts, vast ones, within the limits of the United States which were deserts when civilized occupation of the country began, but none of these were inside the boundaries of this State. All that now exist here, and there are thousands of miles of them, were made so by man. I do not say that it was ruthlessly done. In most instances it was done through the agency of the lumbering industries, which were essential to the vast commercial prosperity the State has attained. The matured crop stood waiting for the axe of the chopper, and but for this must have fallen and decayed unutilized. Surely, no political economist could have desired this. The sole and only fault lay in this, that when nature was willing to have restored a timber crop to those now desert hills, not a hand was raised to assist her. On the contrary, fires were allowed to sweep almost unrestricted over thousands of square miles, undoing all that the natural restorative agencies were tending to do.

The utter folly of the argument that we should have had to wait for a half century for a second crop is now shown by the fact that there are extensive districts in the State, where, if fires had been kept out since the first growth of trees was cut, a vigorous, marketable second crop would at this hour have been inviting the lumberman's operations. It is probably quite within the limits of truth to say, that now a new crop of white pine might be standing in Pennsylvania, which in round numbers would be worth hardly less than eight hundred millions of dollars, on ground which is either wholly useless or which is so unremunerative in agriculture that it is but an incentive to discontent, or an excuse for such a state of poverty as no progressive American wishes to consider a necessary condition of things, tending to degrade rather than to elevate agriculture.

Count, if you please, the actual loss, then, at eight hundred millions of dollars to the State. That comes out more clearly if we put it in another way; reckoning the period of early maturity of a white pine crop at half a century. It is true that the actual loss to the State would not be one-fiftieth of the above fabulous sum, if the crop were destroyed when it was but a year old, or a twenty-fifth if the fire claimed it at two years old. Yet, as a matter of fact, it would be a correct statement of the potential loss, for in half a century the crop would have had the value indicated but for the fire. With this understanding then there can be no fallacy in my assertion that in each year of growth there would be a potential value to the State of more than sixteen millions of dollars in this crop we are supposing. I have taken minimum figures in making these estimates.

This, however, is not all. It is almost certain in the light of known facts that there exist within our State limits enough of land otherwise useless, to maintain perpetually growing timber sufficient for all our legitimate needs, and leave a large remainder for export. Instead of which, what do we find? Not less than one-sixth of the area of the Commonwealth producing no surface crop of known value, but serving as a nursery of floods on the one hand and a cause of prolonged low water on the other. These are the indisputable, naked facts. Why should this continue? That a Commonwealth like ours should allow it shows a lack of statesmanship and a want of business management of which no wise man would be guilty if his life were as long as we fondly hope that of the State may be. And, in truth, is not this the proper light in which to put the question? Our children will represent the Commonwealth of the future, and their lives and interests are but onward extensions of our own. It, then, is fairly within our province to ask what business methods should be adopted to end this period of drain upon the Commonwealth and to inaugurate a period of reproduction.

There can be no doubt that the first step would be to accept all the help we can get from natural forces. To this end the perpetually occurring forest fires should be, not stopped, but never allowed to begin. Thus far not a single fire law on our statute books has been given a chance. On the contrary, every one of them is in contempt, mainly because they have never been enforced. Here, for example, is one which makes it the duty of the commissioner to appoint a person, or persons, to ferret out those who start forest fires. Yet in no county of the State, so far as I can learn, has this been done. There must be some cause for this condition of affairs. As Pennsylvanians, we do not usually hold our laws in contempt. On the contrary, we are among the most law abiding. The probable solution is that the clause which follows the one ordering the appointment of these officers, specifies that they are to be paid by the counties themselves. This is so unjust that we can hardly wonder the laws remain a dead letter. The larger the area of timber land, a county has to protect, the smaller number of citizens it has to extinguish fires or pay taxes. When you remember that most of these heavily timbered areas are important water-sheds for the rest of the State, and think that the even flow of water for all the lands below depends greatly upon, whether or not, there has been a recent forest fire to destroy the capacity of the soil for holding moisture, you will realize that the present law, in placing the heaviest tax upon the poorest communities, and allowing those who receive incalculable and direct benefit to go untaxed. There is but one natural solution to this problem; and it is to make suppression of forest fires a State duty. They are the result of ignorance, carelessness or maliciousness. These cover practically every case of forest fires. Is there one of these factors, for which an excuse can be made when such vital interests are at stake?

This, however, is not the place to go into details of State management of forest fires.

The second element of the problem is to make it worth the while of the owner of the lands to cover them again with trees, on the basis, that the State will protect him against fires. I am convinced that the shortest way to do this is to offer a direct bounty for every acre of trees planted, or allowed to start as sprouts from the stump. Practically, such a law already exists. It is inoperative, because the bounty is too small. I do not advocate this measure because it benefits the individual, but because it is to benefit the State. The principle of bounties to any class may or may not be right. It all depends upon whether the State which bestows the bounty is to get that bounty back with interest. The individual, in my view of the case, simply receives his reward, because he is working for the State.

There always will be periods of drought and times of freshets, just as there always have been; but it is quite clear that the number of these periods of disaster can be greatly lessened by anything which retards the flow of water from steep hill sides. What the value of the leaves, alone, in a forest is, may be crudely shown by weighing a body of freshly fallen leaves. Put them in a pile over winter, uncovered, then weigh them in the spring. The difference will be their moisture retaining capacity. But, besides the leaves, we must count in, the downward pointing roots and the humus, both of which conduct the water toward the depths where it is safe against surface flow, or surface evaporation. Now, as against the cost of these agencies under bounties, put the bridges swept away. The fences destroyed, the roads washed out, the farm lands covered with stones or gravel, the interrupted travel and traffic, and often the loss of life. It will probably be found that the State would be the gainer, because in addition to all these savings, she would have a growing crop of timber which, when matured, would be a source of revenue to her.

As for the taxation of standing timber,—one may as well come out on a distinct platform at once;—it is a wrong, both to the owner and to the Commonwealth, but chiefly to the latter. It is false in principle, for it taxes a man for a benefit which he has not yet received. If a timber owner holds lands twenty years and then sells them at an advanced price, he then receives his increment and income, for both of which he should pay. So also he should when he realizes on his investment by cutting the trees. But, taxing standing timber is not only false in principle but it is pernicious in its results, because it is confiscating (practically), the lands, to avoid which the owner cuts the trees, and so inflicts an injury (as things now are), on the State. Let the State receive its ncome when the owner gets his. There are known methods of doing this.

It is objected that if growing timebr is exempted from taxation, it would work a wrong to the poorest counties, because it would leave them without requisite funds for opening and repairing roads. This, of course, would be bad enough, but is it any more than taking the taxes and failing to repair the roads? The argument may prove too much.

Let us look just a little down into the future: This good road question is a rising one. It will not down. It has come to stay and we may frankly meet the issue. The State requires ready means of communication from place to place. Without them we should be largely at the mercy of our railroads. In proportion as these are good, we are less dependent of the railroads.

Now, is it not possible that we should be taking a step on which the wisdom of the future would pronounce favorably, if we were to do this?

Remove the tax from standing timber, until it is sold or cut. And whatever revenue a township loses, by thus exempting the timber, let the State restore, to be expended under competent supervision in maintaining a proper road system in that township.

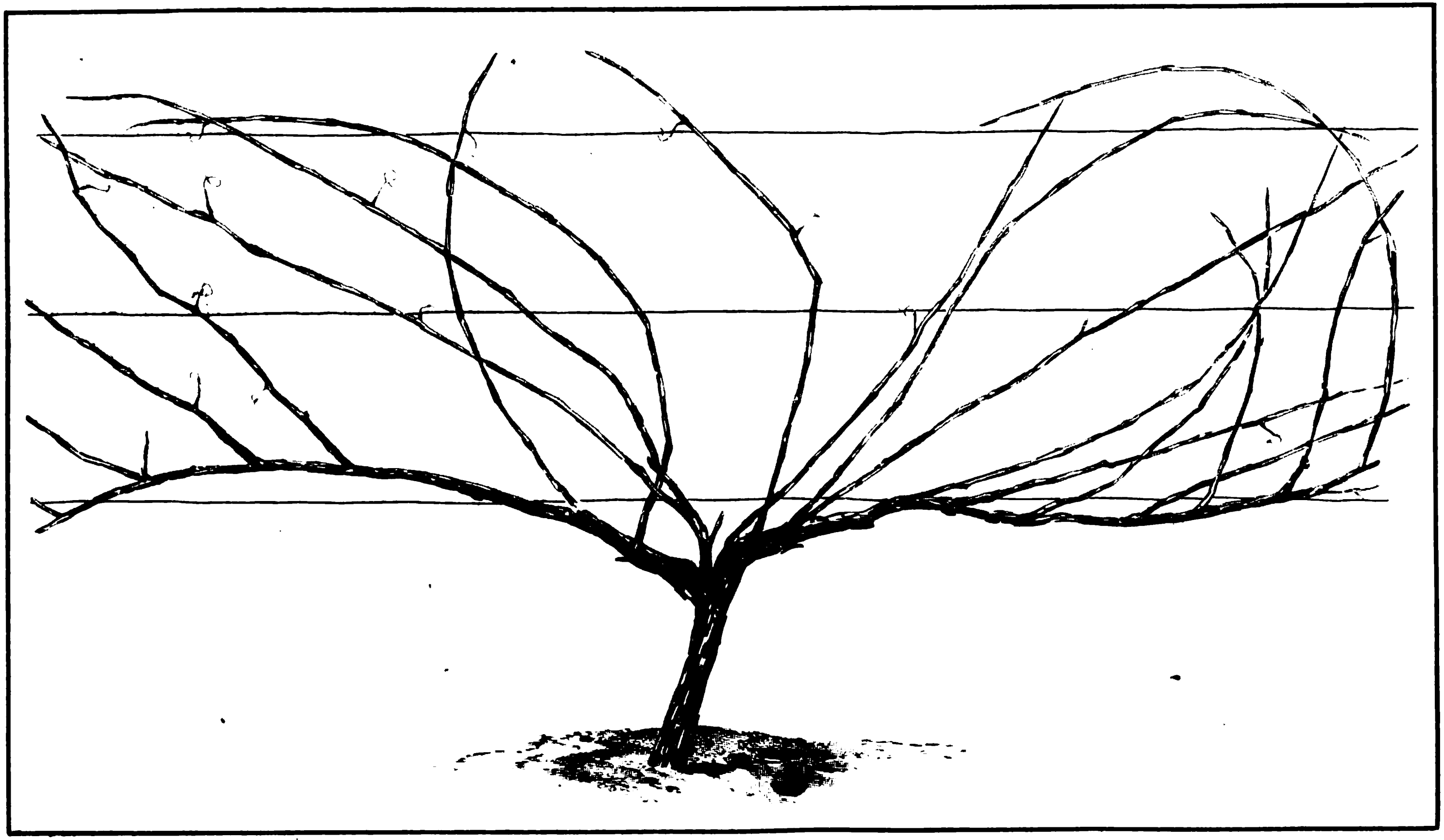
It will be observed that this grants the largest aid, just where need of development is greatest, and that the State helps itself as much, or more, than it helps the townships.

PRUNING GRAPE VINES.

BY PROF. GEO. C. BUTZ, *State College, Penna.*

The question of pruning the grape vine is a perplexing one to the novice in grape growing and even troublesome to persons with several years' experience at such work. The confusion generally arises at the sight of many systems which by their complex and finely drawn details obscure the few fundamental principles of the art of pruning. Pruning is an absolute necessity in the cultivation of the grape, whereas every other fruit is frequently grown in America without any systematic pruning and attended with a certain degree of success. We may find many fruit trees which have not been touched with knife or saw since the day they left the nursery except to remove a dead or broken limb, yet the trees are generally well shaped, and yield their fruits. However, it is the business of the orchardist to practice his art, (of which pruning is but one operation), upon those trees which without his care would degenerate into sickly, misshapen and unprofitable trees. In this country fruit trees are allowed to follow their most natural tendency in growth, correcting only the irregularities when they appear. We would find it exceedingly unprofitable to imitate the French and English by adopting their Espalier or Cordon system of pruning and training the apple and pear. These systems, to an almost absurd extent, force the growth of the tree from its natural habit, because it has been found profitable in Europe to do so.

Now, the grape as we know it in its most natural condition is a rampant vine, ascending large trees 20 to 30 feet high, its branches twisting about the limbs of the tree, twining among the branches overhead and finally hanging into the space below. It would be impossible therefore to cultivate the vine extensively by permitting it to pursue its most natural course of growth.



PRUNING GRAPE VINES.

Fig. 4.—High Renewal System, before Pruning. (After photograph by Bailey).

1st. The most apparent object of pruning the grape, therefore, is to facilitate its cultivation. Nearly fifty years ago, A. J. Downing wrote in his most excellent book on fruits that "The ordinary culture is as simple as that of a field of Indian corn," and devotes but one-half of a page to pruning and training of the American vine. A vigorous plant will in one season make a growth of ten to twenty feet, and in the following year the buds farthest from the roots will burst into growth and thus further extend the branches. A plant with a definite root system can support only a definite amount of new growth of stem or fruiting wood, and if this can be confined near the roots, the space required by that plant is less, and the management of it is simplified. The ground must be frequently worked with horse and cultivator; the vines must be sprayed with fungicides to ward off fungous diseases from the foliage and fruit; the fruit must be easily reached and carefully handled when ripe; and all this work can be accomplished most conveniently and most successfully where a system of pruning has been carried on.

2d. Another object in pruning the grape is to maintain only a thrifty growth of vine. If a vine lacks vigor its growth will be so meagre and so weak that it is impossible for it to bear any fruit, and the sprouting from many buds will demand so much from the roots that no thrifty wood will be developed for even the next season. By properly pruning away all weak wood, leaving only a few buds on the best canes from which alone new wood may be produced, (while the roots have not been disturbed), strong healthy shoots would be forced out, and these would react in the development of new roots and the whole plant would be strengthneed for future usefulness.

By keeping in mind this second fundamental principle, and pruning accordingly each year, a certain amount of vigor may be maintained in all the plants of the vineyard.

3d. Another object of pruning is to increase the size and improve the quality of the fruit. To illustrate this point we need only compare the fruit on vines allowed to run over trees or high trellise where pruning has been disregarded, with fruit from well pruned vines in the vineyard. The former vines begin with very many panicles of flowers; these set more fruit than th vines can possibly mature; as a consequence the green berries are dropping from every bunch until the time of maturity, when we find the bunches loose, with few berries which are small, lacking in substance, sweetness and flavor, and would scarcely deserve to be rated as third class fruit. Fruit from thoroughly pruned vines is large, in well filled clusters, the berries almost bursting with their rich store of juice and sweetness.

These three objects of pruning are of equal importance and must be given due consideration in the vineyard, and they constitute the answer to the question "Why do we prune," and show that thus far there is nothing mysterious about it except the mysteries of nature existing in plant life.

When should we prune? The proper time for pruning the grape vine is during the season when the foliage is off. This may be as early as November. From this time forward until the middle of March in this latitude, the vineyardist may choose to do the work, as seems most convenient to him. In the extensive vineyards of New York State the pruning is often begun in November. At this time the wood is well matured and the buds developed. If the cane is cut off two inches above a bud, that bud is perfectly safe against the rigors of our climate. If the work is postponed until the latter part of March or April, it is attended with a flow of sap from the cuts known as the "bleeding" of the vine. The bleeding season is determined by the state of the atmosphere usually beginning with the first warm weather of March and continuing with increasing force about a month, then with decreasing force until the young foliage is ready to utilize the supply of sap and throws off the surplus by transpiration. The pressure of this watery sap in the grape vine is surprisingly great. It was determined in the European vine as early as 1731 by Stephen Hale (1) who attached a tube of mercury to the stump of a strong vine. He found the pressure of the sap great enough to raise the mercury 38 inches in the tube. Thus is equivalent to a column of water slightly over 43 feet. The loss of sap is evidently very great in such a case, and yet it is an unsettled question whether the vine sustains any injury from bleeding. This doubt alone would indicate that the question is not a serious one, although it is always safer to prune early and avoid any possible loss from bleeding.

Summer Pruning.

A system of pruning in midsummer is sometimes practiced with a view to improving the fruit then hanging on the vines. The practices differ, as do also the recommendations of some of the best writers on the subject.

Professor E. J. Wickson of the University of California, writing as late as 1891 (2) upon the practices in that State, says "Summer pruning, if done early enough, and this would be while the growth is still soft at the point of removal, will induce the growth of laterals and will shade and improve the fruit, and at the same time thicken the growth of the main cane and strengthen the connection with the spur." These remarks concern the European grape.

Professor L. H. Bailey of the Cornell University writing in 1893(3) on American Grape Training, says "Vines are often weakened by Summer pruning. These dangers can be overcome by careful attention, however, especially by heading in very lightly and by doing it as late in the season as possible, when new lateral growth does not start readily."

There are both very eminent authorities on horticultural subjects, and yet are directly opposed to each other upon the point in question. The truth of the whole matter is that it is difficult to lay down definite rules or directions which may be followed successfully in all vineyards. The very best directions can only lead the learner, but he must go cautiously and observe closely. When he has learned wherein his experience teaches better than his instructor, he must of course follow the former, rise above the simple rule operations and treat his vines not as strangers to him, but as old acquaintances whose wants he can recognize from the expressions they wear.

Summer pruning is sometimes done when the fruiting canes have grown several joints beyond the clusters of fruits, by clipping or

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1. Statical Essays, I., p. 114.
2. California Fruits, 1891, p. 392. Wickson.
3. American Grape Training, 1893, p. 33, Bailey.

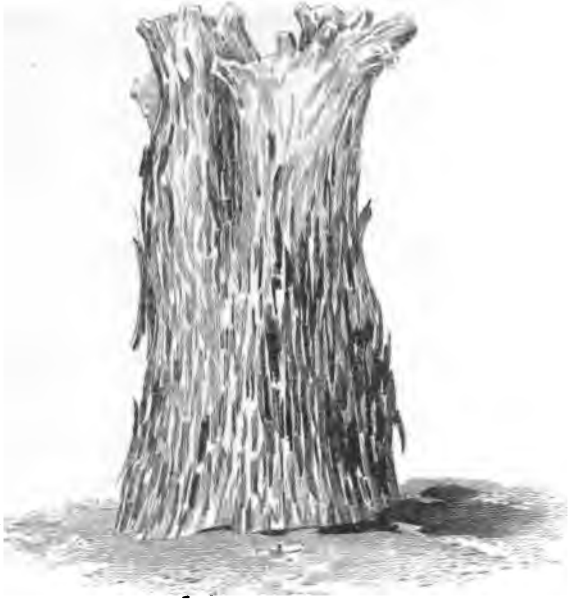


Fig. 1.

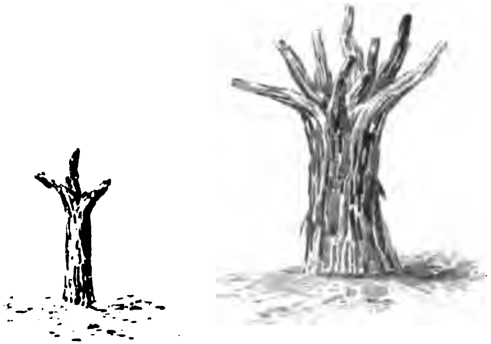
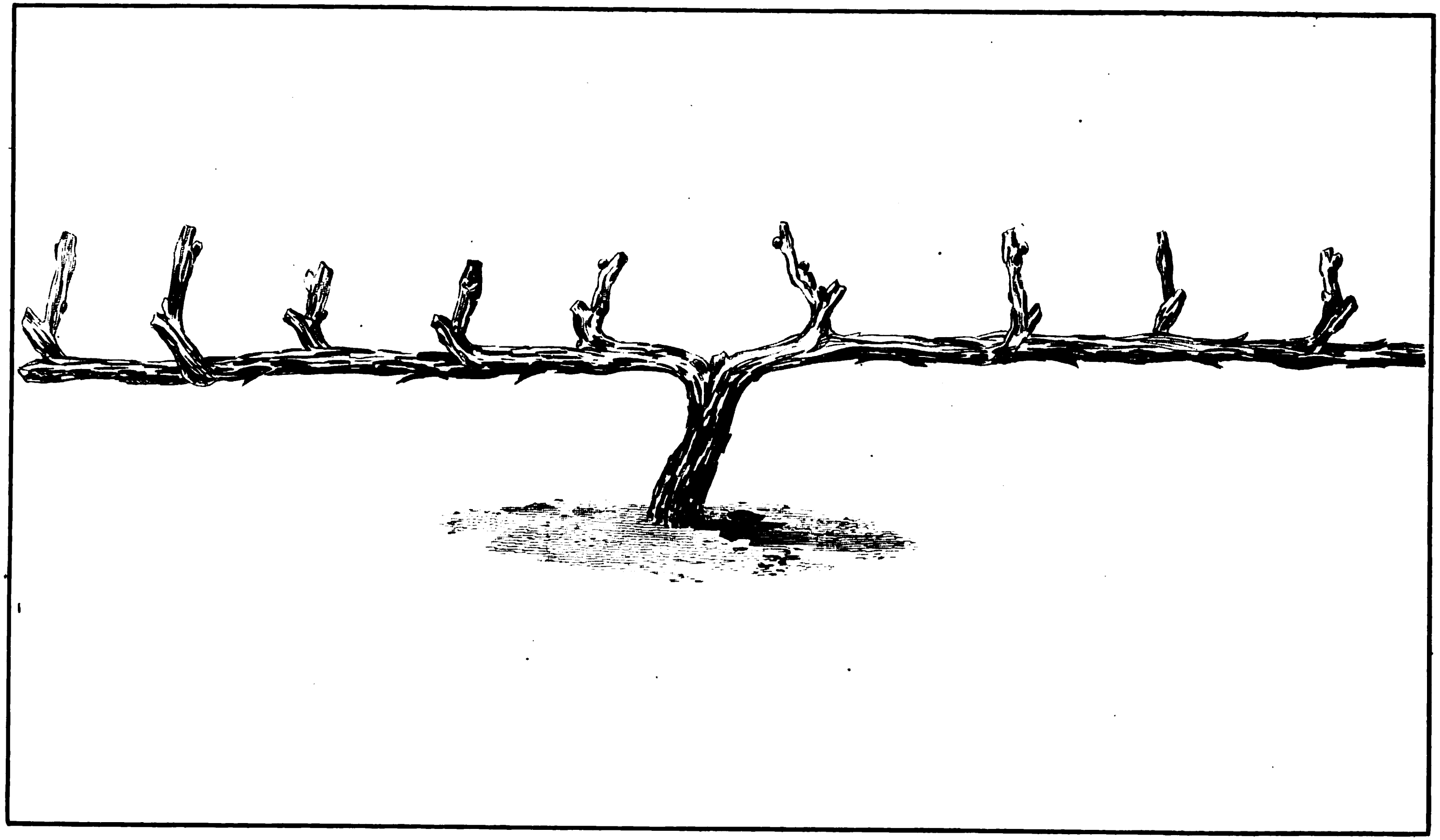


Fig. 2.

Fig. 1.—Stump of European Vine. over 50 years old.

Fig. 2.—European vines pruned to vase shape.

PRUNING GRAPE VINES.



PRUNING GRAPE VINES.

Fig, 3.—Horizontal Spur System Vine at end of fourth year, pruned.

pinching off the heads, and also cutting out the new weak growth bearing no fruit, for the purpose of directing more work of the plant into the fruit for its fullest development. More generally, however, summer pruning is not done until the new canes are riper and longer so that they interfere with cultivation and shade the fruit too much. Such strong varieties like Concord and Niagara receive such attention. This pruning is frequently done in a summary way with a sickle or corn-cutter.

Having briefly answered "Why" and "When" to prune, we have now to consider "How" to prune. Of the so-called systems there are very many, more indeed than it would be profitable to consider. What would seem like the simplest method is practiced upon the wine grape in Europe and California. It is known as stump pruning. This is begun by cutting away the first year all wood except the strongest cane which is headed back to the height of the intended trunk or stump, usually from one to three feet from the ground. Thereafter, only the growth from near the top is encouraged, and annually this new wood is entirely cut away leaving a few short spurs. This soon results in a stiff stump (as in Fig. 1), requiring no stake nor trellis to support it, even when heavily loaded with fruit. There is no tying nor training necessary. The new wood grows out in an umbrella fashion, holding the fruit above ground, and as it extends in growth it trails upon the ground. The foliage is thus exposed to the best light, the fruit is shaded and much work is saved. Such stumps may be seen in California, fifty or sixty years old, and in certain vineyards of France as much as one hundred years old.

A modification of this system is more generally preferred now for the wine grape. It is fashioned upon the Goblet form of the French, as will be seen in the illustration, Fig. 2.

Both of these systems are unsuitable to the varieties of our native grape which is less rampant in growth, and would suffer greatly from such severe pruning.

The first system of pruning generally adopted for the American grape is known as the Horizontal Arm Spur System. It was first clearly described by A. S. Fuller, in 1864, (4) and for that reason it has since frequently been called the Fuller System.

The ideal form of the vine when pruned at the age of six or eight years is illustrated in Fig. 3, having two permanent horizontal arms in opposite directions trained along the lower bar or wire of a trellis. From every joint are short spurs, each capable of carrying two new fruit bearing canes, which are tied upright on the trellis. Therefore the fruiting wood is always in a perpendicular position. These spurs after a few years become very weak and must be cut entirely away to encourage the development of a new spur from the horizontal arm, and even these arms will in time need to be renewed from the head or very base of the vine. It is almost impossible to find an American variety of grape which when pruned according to this system will support the full number of spurs shown in Fig. 3. To secure perfect fruit and maintain healthy vines the pruning must carefully accommodate the amount of fruit bearing wood to the age of the vine and the vigor of the variety. It is difficult to train such weak varieties as the Delaware and Hartford Prolific by this long arm system.

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4. Grape Culturist, A. S. Fuller, 1864.

The tendency of the spurs and arms to become weak after a few years, when new wood can not readily be formed to replace it, constitutes a great objection to the Fuller system and has brought about modifications to correct this defect. One of these modifications worthy of our attention is fully described in Professor Bailey's recent little book on the subject, and is considered by him "one of the most serviceable of any of the styles of training." He has called it the

High Renewal System.

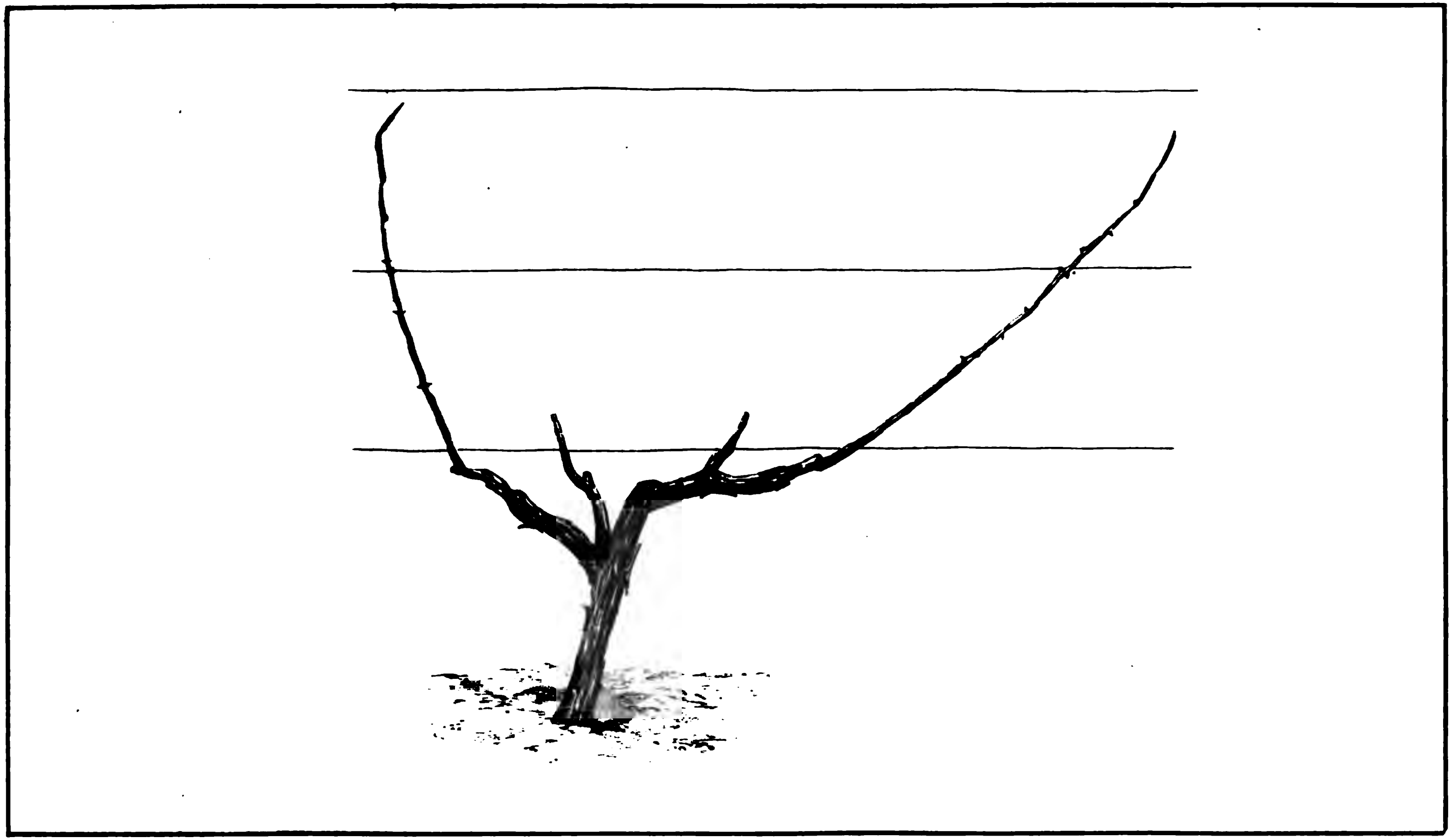
It is now generally employed in the vineyards along Lake Erie, in New York, and as it will commend itself to the vineyardists of Pennsylvania I will describe it in detail more than the preceding. The vines are planted the usual distance apart (eight feet for Concord) and provided with a trellis of three strong wires, the lowest being about two feet from the ground. The strongest cane of the vine is headed down to this wire to encourage two good canes for the next season. This high branching is preferred because it carries the fruit where it may be kept clean, and the vines do not so much interfere with the plow or cultivator while working the ground. If two strong canes proceed from near the base of the vine, they are both carried to the first wire in the form of the letter Y, and usually at the end of the second season after planting, there will be two strong canes to be cut back to sound wood, leaving each with five to eight buds, and tied to the lower wire in opposite directions.

In the third season shoots will grow from these buds and be tied upright to the upper wires of the trellis. Some fruit may be borne this season, but it would be better to remove all flower clusters in the spring. At the close of the third season the arms with all their branches are completely cut away, leaving only two strong canes which proceed from near the head of the stock to be properly shortened and tied to the lower wire the following spring. From these canes will grow the fruit bearing branches of the fourth season. At each later pruning two spurs of sound wood are left at the head of the vine (see Fig. 5), to yield the renewal canes for the following year. These spurs are also renewed from the old wood every two or three years. And so, year after year, the horizontal arms are replaced by new wood. A strong vine cared for by this system for five or six years would appear before pruning as the illustration shows in Fig. 4, and after pruning, as in Fig. 5.

It is customary with strong vines to carry four long canes, two each way, on the lower wire, and this may profitably be done with such varieties as Concord and Niagara.

The Kniffen System.

A system of pruning that is quite the reverse of any I have previously described, is now the favorite style in the Hudson Valley vineyards. In this the permanent vine is carried directly to the top of the trellis and made fast. Annually new canes, after the manner of the High Renewal system, are tied to the horizontal wires of the trellis, and the new shoots are allowed to droop from the trellis instead of being tied in an upright position. This method seems to approach the true nature of the vine more closely than any other, and its con-



PRUNING GRAPE VINES.

Fig. 5.—High Renewal System, after Pruning. (After photograph by Bailey).

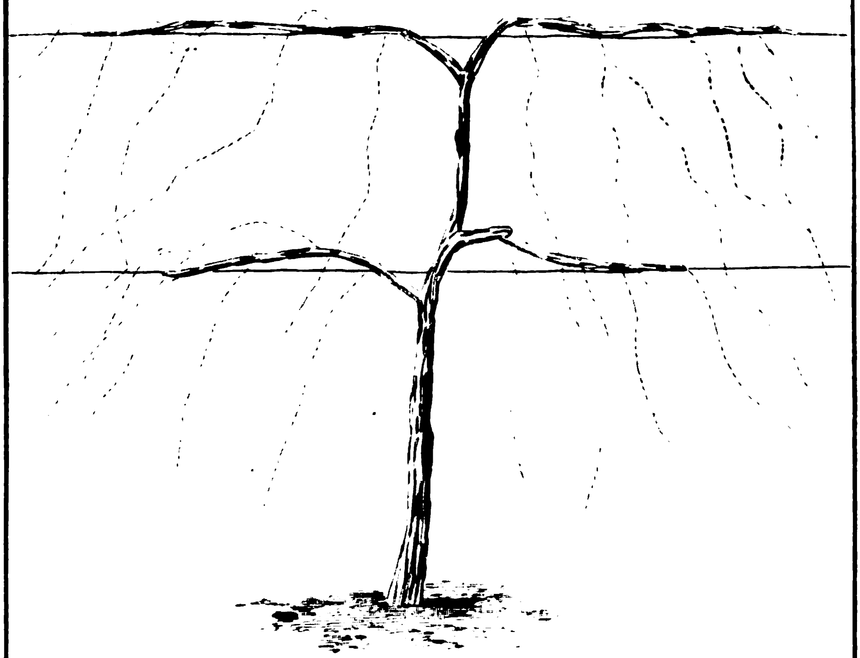


Fig. 6.

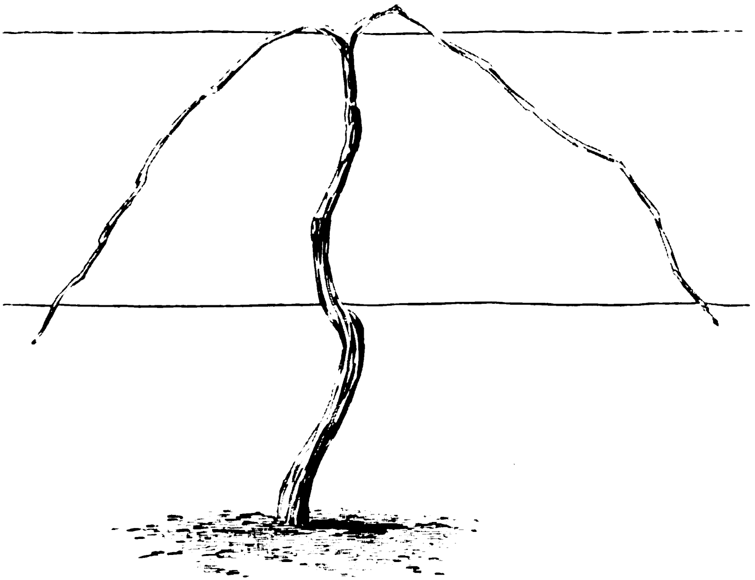


Fig. 7.

PRUNING GRAPE VINES.

Fig. 6.—Kniffen System—four arm—dotted lines indicate the new growth from the pruned vine.

Fig. 7.—Kniffen System—two arms—Pruned and tied.

ception, like many other useful thoughts, originated with an accident. It is known as the Kniffen System, and the originator, William Kniffen, was only a stone mason fifty years ago, devoting his leisure to the cultivation of a few acres of ground in which he had a small vineyard. One day the limb of a tree fell upon a vine and crushed it. When the fruit was ripe he observed the fine condition of it in certain positions on the vine, and from this suggestion he worked out this drooping system of pruning which, because of its good results, was soon adopted in other vineyards along the Hudson river, and is now extending beyond that region.

This system has many advantages which will recommend it to every extensive grower, the principal one being that no summer tying is necessary. It is particularly adapted to the strong growing vines, but has been modified also to suit the dwarfer varieties.

The original type is illustrated in Fig. 6, which shows the vine with four horizontal arms attached to the wires, the two upper longer than the two lower arms because the higher arms will carry the bulk of the fruit; in fact, some pruners have discarded the lower arms entirely and thus direct all energy above. The length of the arms are usually shorter than is recommended for the Fuller System, but varies with the vigor of the plant and variety. When the vine is pruned all the wood is cut away to four spurs on the permanent wood, except one strong new cane from each spur. These are cut back to six or eight buds, and in the following spring tied to the wires. Only two wires are used and these are placed about three and a half feet and five and a half feet from the ground.

Two Arm System (Fig. 7).

The two arm Kniffen System simply disposes of the lower arms as previously suggested, because these have been found to bear but little fruit, and the arms at the top wire may be bent down to the lower wire and tied, giving a drooping position to the arms, as illustrated in Fig. 7.

In Western Pennsylvania, many vineyards are planted on hillsides where instead of a trellis, single heavy stakes or posts are driven in by the plants, and the vines are pruned and trained to the post. The pruning consists in cutting back to the original stump about two feet high, leaving five or six short spurs of the best canes, or one or two strong canes six to eight joints long. These are tied to the posts in an upright position, or bent in into a complete circle and secured by tying. And again three stakes may be seen at one plant with these long canes distributed over them.

It would be tiresome to enumerate all the modifications of these systems of grape pruning, and perhaps enough methods have been cited to indicate the principles which are to determine the style of pruning best suited to a vine, a variety or a locality. A consideration of many systems will have a tendency to influence a vineyardist to originate a system of his own, and very often this is illustrated in practice. Whatever system is followed, the vine should be regarded with respect to the natural vigor of the varieties, and more particularly with respect to the individual plants, seeking to cover the trellis evenly, to encourage healthful growth, and as the older wood becomes exhausted, to renew it from below even though it must be from the ground. The vine is not a short lived plant, but by much and close pruning the old stumps become covered with scars which are often a source of weakness to the plant. In such instances it is better to cut away severely and replace by new growth from below.

SILOS AND SILO BUILDING.

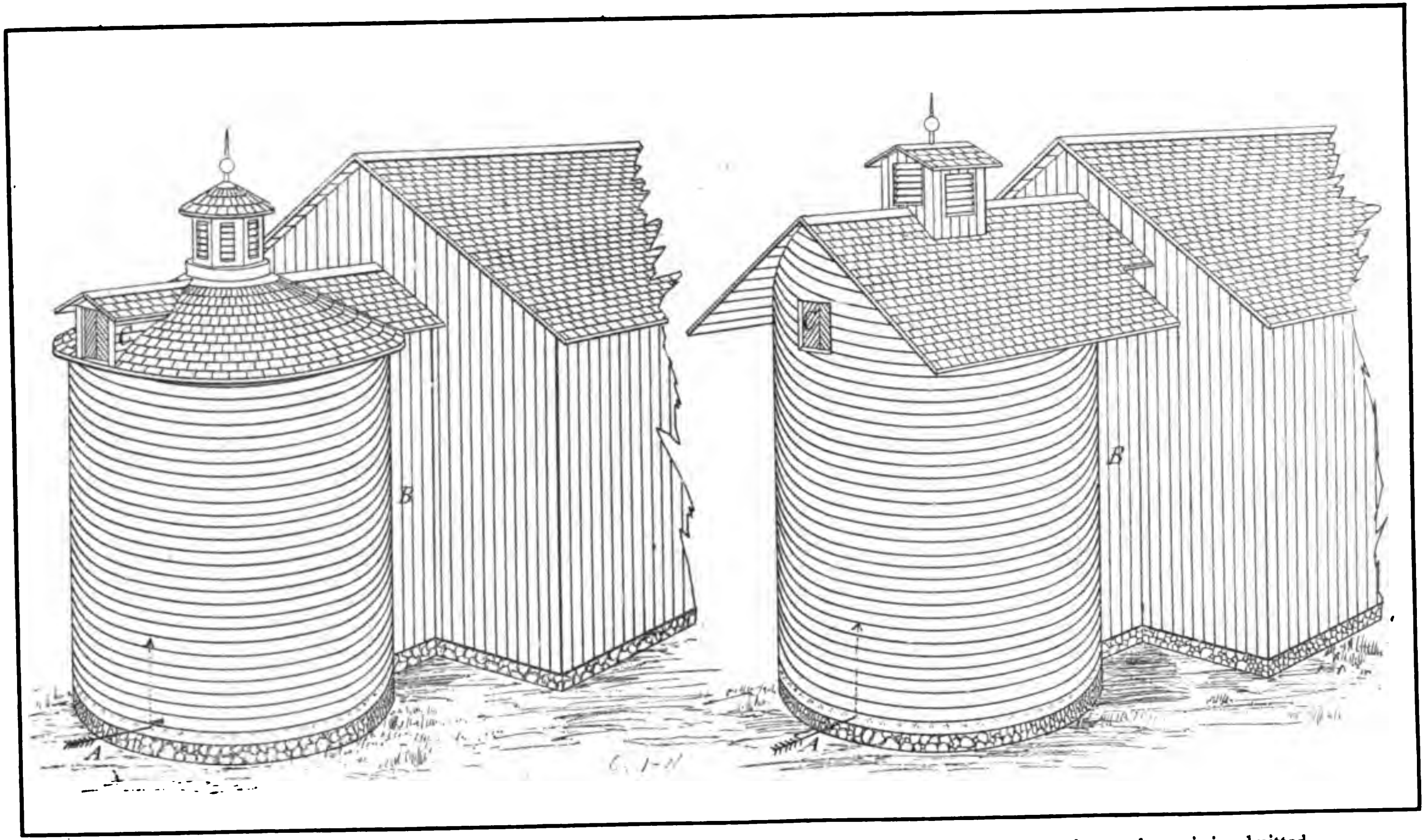
By Prof. H. J. WATERS, *State College, Pa.*

The word silo, according to the best authorities, is derived from the Greek, and was introduced into France from Spain. Air tight pits or receptacles essentially on the plan of our silos have been used from the earliest times for the preservation of cereals against insects and perhaps in some cases against fermentation. The preservation of green fodder in closed chambers was practiced in Europe prior to the beginning of the present century, although the history of the earlier processes and the conditions which led to their development, is fragmentary and in the main, unwritten.

The introduction of this process of preserving green food into the United States dates back to 1874, when in a barn in West Chester county, New York, a pit was made for the storage of brewers' grains, in which it was reported that several thousand bushels were kept in good condition for several months by simply excluding the air. Mr. Goffort, a gentleman farmer of France, published a work on ensilage in 1877, which was translated into English and published in New York in 1878. This translation had a wide circulation and gave to the building of silos its first great impetus in this country. Since that time there has been a steady and uniform growth of the system in this country, confined chiefly, however, to the districts where dairying is the leading interest. Less interest has been manifested in the silo by the farmers of Pennsylvania than by those of several other States similarly situated, and yet the large number of inquiries received at the College and Experiment Station from every section of the State, the interest manifested in the subject at farmers' institutes, indicate that we are upon the threshold of a silo building era. It is the purpose of this article to bring together in as small a space as possible the results of the experience and experiments in the construction of silos.

When we speak of a silo we mean the pit, chamber, building or receptacle in which the green material is preserved. This preservation of green and easily destructible material is due to the practical exclusion of the air from the mass by the tight walls of the silo and the material forming a compact mass by its own weight. No salt or other preservative is used. By silage or ensilage is meant the material that is stored in a silo, and may be of green corn, green clover, grass, rye, or other valuable forage crop.

It is interesting to note in passing, that the extravagant claims at first made by the silo enthusiasts, which at once met with the sternest



Showing two methods of roofing round silos and the manner of connecting them with a barn. A A shows where air is admitted between the studding to ventilate behind the lining. B B, the feeding chute. C C, filling window. The cupola is essential to perfect ventilation.

opposition from scientists and the most intelligent farmers, have been so modified and the processes so improved and perfected that there remains no question as to the usefulness of the silo as an adjunct to the euipment of every stock farm. It is impossible in this paper, however, to enter into a discussion of the relative merits of dry curing and siloing, but sufficient to say that when succulent food is required for winter feeding, the testimony of experiment and extensive practice points strongly to the conclusion that silage is the cheapest form in which this can be furnished. Also that it furnishes a very satisfactory solution of the perplexing summer soiling system.

Convenience in feeding the silage should be the controlling principle in selecting a location, for it should be borne in mind that the green material can be elevated and transported a considerable distance by means of a carrier attached to the cutter, at a very small cost, when filling the silo. whereas it is quite expensive and inconvenient to raise and transport the silage any considerable distance as it is being fed, owing to the fact that this labor must be done in the main by hand.

It should, if possible, therefore, have a short and direct communication with the main feeding alley in the barn, but need not necessarily be under the same roof, although this arrangement is on the whole preferable. The silo may be entirely under ground, or all above ground, or partly under ground, as cheapness of construction and convenience may direct, but in no case should it be necessary to raise the silage out of the pit. The bottom of the pit should never be more than three or four feet below the level of the feeding floor.

A silo may be constructed of stone, brick, metal or wood, and of whatever material it is constructed, it should be:

First. As nearly air tight as possible to prevent the admission of free oxygen in the absence of which the bacilli or germs producing the more important destructive changes in silage, do not thrive.

Second. The inside surface should be as smooth as possible, to allow the silage to settle easily and uniformly, without leaving air pockets under the projections, as in the case of rough walls.

Third. That it should be of such form or shape as to expose the smallest possible wall surface in proportion to its capacity. It is very rare that silage rots excepting in the corners and along the walls.

A square pit is preferable to a rectangular one. For example, a pit 16 feet by 48 feet and 22 feet deep has 2816 square feet of wall surface exposed to the silage, while one 32 feet by 32 feet and 22 feet deep exposes the same area of wall and holds fully one-third more silage. A cylindrical form is better than either of the above, as the wall surface is still further reduced per ton of capacity, and all corners are dispensed with. For example, a cylindrical silo 37½ feet in diameter and 22 feet deep has the same wall surface as either or those above described and holds more than two-thirds more silage than the rectangular one.

Fourth. Its greatest dimension should be its depth. Silage very rarely keeps well without heavy, and therefore costly artificial weighting when when under twenty feet in depth. It is a well known principle that the greater the weight, the more perfectly the air is excluded, and the more perfectly the silage will keep. Not only does the silage keep better, but the storage capacity increases much more rapidly than the depth until the weight has become great enough to compress the silage to its maximum limit, beyond which the capacity increases directly as the depth. For example, Professor King, of the Wisconsin Experiment Station, found that a silo 14 feet deep contained approximately 382 pounds of silage per square foot of bottom, while one twenty-five feet deep contained 1192 pounds for each square foot of bottom, an amount more than three times as great. This means that in round silos, where no stronger studding are required for the increased depth, with the same expense for roof, the same expense for foundation and bottom, three times the amount of silage could be stored by simply doubling the heighth of the sides.

Fifth. The walls should be thick enough to protect the contents against freezing.

Sixth. The floor or bottom of the silo should be made of concrete, cemented as a protection against rats. This protection against rats may in many cases be omitted the first year, as it is not likely that they will find their way through the foundation walls in that time. At the Pennsylvania Experiment Station, a dirt floor answered every purpose of a silo for a few years, but the results were disastrous when they did find their way in, as they burrowed up through the silage and along the sides, admitting air and causing an enormous loss by rotting.

A cubic foot of silage weighs from 30 to 35 pounds. It is usually estimated that a cow will eat a cubic foot of silage per day. Given therefore, the number of cows and the number of days they are to be fed, it is an easy matter to determine approximately the size of silo required. In deciding upon the size, however, it is important to consider the feeding area. It is necessary to feed from the top, and at least two inches per day must be taken off in winter and three inches in summer, to avoid spoiling or great loss in palatableness. To avoid exposing too great a horizontal area, a partition of two-inch plank may be used, and one chamber fed out at a time. This partition gives ample strength when both sides are filled at the same time.

Square or rectangular silo: It appears from what has already been said, that the cylindrical silo is preferable to either a square or rectangular one, and it is furthermore true that in cost of construction, the round silo is the cheapest yet devised. In case, however, it is desirable to convert one of the bays of the barn into a silo, the square or rectangular form may be the more economical. The foundation should rest on solid earth, below freezing, extend fully eight inches above the surface of the ground, and be at least eighteen inches thick. The silo should be at least 2 inches by 10 inches, thoroughly spiked together, securely anchored to the foundation and laid in mortar. The studding or joists should be 2 inches by 12 inches, placed about sixteen inches apart. By having the sills two inches narrower than the joists, an air space is left at the bottom for ventilation between the walls, which is very important to prevent premature decay of the sills and walls.

The plates should be of double thickness of 2 x 12, securely spiked together and well nailed to the joists. As a further precaution against spreading in very deep silos of this form, the rafters which support the roof will also serve as braces by putting in under braces of 1 x 8 inches, fastened at the base of the rafter and reaching to the opposite rafter about one-third of the distance from the top. The lining should be of two layers of good boards of uniform thickness, all joints broken, and with a layer of tar paper between. Professor King recommends painting both layers of boards on one side only, with hot coal tar boiled until it is not sticky when cold, the tarred sides being placed face to face with the tar paper between them. The silo need not be sided if built in the barn where there is no danger from freezing, otherwise it should be boxed with any good material suitable to the purpose.

Round silos: We have already learned that the round or cylindrical silo exposes less wall surface and does away with objectionable corners. There are advantages of construction which will be apparent when we understand that for the 2 x 12 sills, studding and plates necessary in a square or rectangular silo, may be substituted 2 x 4 stuff, and the anchor bolts may be dispensed with entirely. In this case the sills and studding do no work excepting to support the roof, since the lining acts as a hoop to prevent bulging or spreading of the walls, as shown in plate on opposite page.

The sill is a single thickness of 2 x 4 cut in 3 or 4 foot sections on the radius of the silo circle, bedded in mortar and the sections toe nailed together. The plates are made in the same manner and nailed to the top of the studding. The studdings are of 2 x 4, placed one foot apart and toe nailed to the sill. Extra length may be avoided in this from by lapping the studding, while in square or rectangular silos this can not be done. The lining is made of two thicknesses of half inch stuff—good fence boards of uniform thickness split in two—tarred as recommended for the square silo with a layer of tar paper between. Take special care to break joints both ways.

A line of doors or openings from top to bottom, one above the other, two or three feet wide and four or five feet high, at intervals of about three or four feet should be provided. These may be closed with pieces of boards or swing doors. The studding each side of these openings should be double.

Comparative Cost of the two Types of Silos.*

Rectangular Silo, 200 Tons. 14x24 inside, 30 feet deep.		
Foundation, 13.44 perch, at $1.20, ...	$16	13
Studding, 2x12, 28 ft., 8,736 ft., at $20, . . .	174	72
Sills, etc., 2x10, 26 ft, 206 ft., at $19, ...	4	94
Sills, etc., 2x10, 16 ft., 426 ft., at $14, . . .	5	96
Rafters, etc., 2x4, 20 ft., 400 ft., at $16, . .	6	40
Roof boards, fencing, 450 ft., at $15, ...	6	75
Shingles, 5 M, at $3, ...	15	00
Drop siding, 8-inch, 2,779 ft., at $16, ...	44	46
Lining, sur. fencing, 4,256 ft., at $15, . . .	63	84
Tarred paper, 426 lbs., at 2c, ...	8	52
Coal tar, 1 barrel, ...	4	50
Painting, 60 cents per sq., ...	15	00
Nails and hinges, ...	10	00
Cementing bottom, ...	5	00
18 ¾ inch bolts, 18 inches long, ...	2	70
Carpenter labor at $4 per M. and board, . .	41	16
Total, ...	$425	08

Round Silo, 200 Tons. 20 feet inside diameter, 30 feet deep.		
Foundation, 7.5 perch, at $1.20, ...	$9	00
Studs, 2x4, 14 and 16 ft., 1,491 ft., at $14, . .	20	93
Rafters, 2x4, 12 ft., 208 ft., at $14, ...	2	91
Roof boards, fencing, 500 ft., at $15, . . .	7	50
Shingles, 6 M., at $3, ...	18	00
Siding, rabbeted, 2,660 ft., at $23, ...	61	18
Lining, fencing, ripped, 2,800 ft., at $18, .	50	40
Tarred paper, 740 lbs., at 2c., ...	14	80
Coal tar, 1 barrel, ...	4	50
Hardware, ...	6	00
Painting, 60c per sq., ...	13	20
Cementing bottom, ...	5	00
Carpenter labor at $3 per M. and board, . .	88	17
Total, ...	$246	59

Round silos built upon the above plan have proven very satisfactory after several years' trial at Wisconsin Experiment Station and on a number of farms in the Northwest. During the past year, several of these have been erected in Pennsylvania.

Another round silo made of staves held together by iron bands or hoops on the style of a large water tank is at present attracting considerable attention. It has not been tried on an extensive scale as yet, but there appears to be no good reason why it should not answer the purposes admirably. Thomas R. Sharp, of Sharp, North Carolina, manufactures such a silo,—the staves being of yellow pine—and ships the whole structure complete, excepting the foundation and roof, knocked down, for about $1.00 per ton capacity. The freight and cost of erecting added to the price of material brings the cost of the silo to about $2 per ton capacity, or practically the same as the round silo first described. Any good planing mill, however, will furnish selected, inches wide, surfaced on one side, jointed and beveled to the circumference of the circle desired, for from $16.00 to $18.00 per thousand. It is not necessary to purchase staves the full length of the silo as one tank may be set on top of another until the required depth is secured. Such a silo has been erected complete for $1.00 per ton capacity without a roof. Openings can be made in the manner already described for other round silos.

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*For the foregoing estimates we are indebted to Prof. F. H. King, of the Wisconsin Agricultural Experiment Station—annual report for 1891—to whom we are also indebted for the cuts of the Round Wooden Silos and many of the data for this article.

The accompanying engravings of complete silos show the method of roofing and joining to the barn when built outside, and need no further explanation.

A metalic silo manufactured by the Smith Pneumatic Transfer Company, Chicago, is built of homogenous steel plate, lapped and double riveted so as to make it perfectly air tight. It also has an arrangement for sealing after the silage has been put in. Theoretically, it is better adapted to the requirements of storing and preserving silage than any other style yet devised. It costs about $4.00 per ton capacity, complete, and experience may demonstrate that it is in the end the cheapest silo to build, but in the absence of this experience it is safe to say that well built wooden silos are, on the whole, the cheapest when properly constructed and cared for.

Professor King, after inspecting a large number of silos treated in various ways, and after making some direct experiments upon this point concludes:

"As far as can be deduced from a study of the ones visited, there appears to be very little, if any advantage from the use of any paint yet tried. Some of the very oldest wooden silos I find are unpainted, and at the same time are perfectly sound, while some that have received apparently the best coating of paint have rotted more than any other, and inside of three years."

To aid those who contemplate building round silos in determining the diameter necessary to give the required amount of silage when the heighth is given, the following table has been prepared, showing approximately the capacity in tons of cylindrical silos of different depths and different diameters, on the assumption that a cubic foot of silage weighs 30 pounds, excepting in depth over thirty feet, in which it is assumed to weigh 35 pounds.

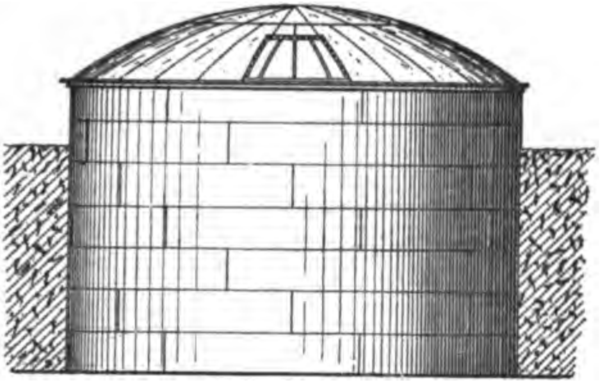


Fig. 1.

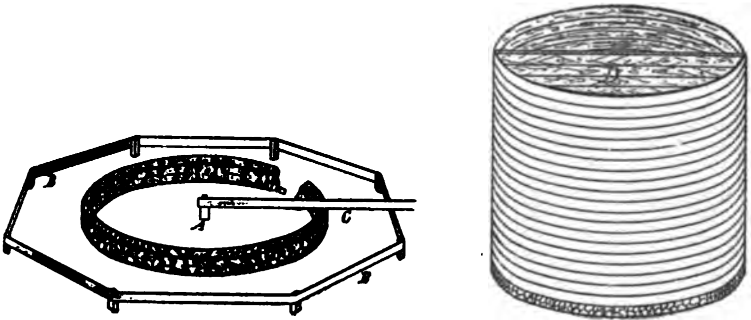
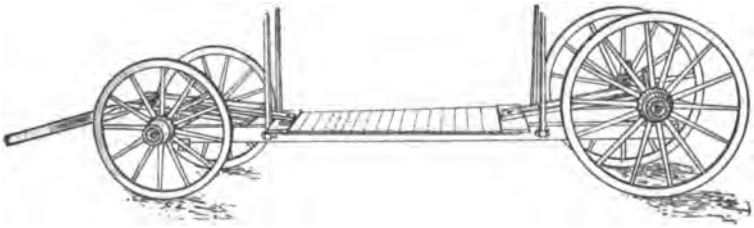


Fig. 2.



Fig, 3.

Fig. 2—.Showing method of laying and leveling foundation of a round silo, and a round silo with a single partition. A, center post with a top level with top of proposed wall. B B, straight-edge boards nailed to stakes driven in ground. C, straight-edge fixed to turn on a pin at A. B B, are all nailed level with top of post A. D, partition in round silo. It may be placed so as to come in the middle of the single line of doors, letting the same doors answer for both sides.

Fig. 3.—Showing low-down rack for handling silage corn, The two stringers are 4x8's, 18 or 20 feet long, swung from the front axle-tree by a lengthened king-bolt provided with nut and washer; and from the hind axle-tree by three-quarter inch rods provided with nut and washer below and with hook above which hang from the bolster. The stringers are about 20 inches apart, outside measure, in front, and a short reach keeps the hounds from tipping up.

Diameter in Feet.	Depth of Silo in Feet.				
	18.	20.	25.	30.	36.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
8,	14	15	19	26	33
10,	21	23	29 4	41	50
12,	30 5	34	42	59	71
14,	41.4	46	57	80	96
16,	54	60	75	105.5	126.7
18,	68.7	76	96	133.6	160
20,	85	94	118	165	198

A discussion of the feeding value of silage, the crops to grow, methonds of filling, weighting, covering, feeding, etc., are reserved for a future paper.

THE FRUIT INTERESTS OF PENNSYLVANIA.

BY CYRUS T. FOX, *Pomologist of the Board, Reading, Pa.*

For some years, the writer, in his annual report to the State Horticultural Association, has endeavored to enlist greater interest in the matter of fruit growing in Pennsylvania as a profitable business venture. It is gratifying to report that more attention is being devoted to the subject by the farmers of the State, who see in fruit culture an opportunity to retrieve themselves for the poor returns obtained from raising cereal crops. While, according to statements received from the different counties, Pennsylvania has made considerable progress in the past few years, much remains to be done to place the industry upon a substantial and enduring basis.

The passage of the "peach yellows" law, approved by the Governor, May 26, 1891, was the first legislation in many years in Pennsylvania bearing upon fruit culture, and it takes position in importance to the agriculturist with the statutes provided for the protection of insectivorous birds. This law, entitled, "An Act to prevent the spread of the disease in peach trees known as the 'yellows,'" has achieved encouraging results in the peach belts of the State. It has establisher a certain degree of confidence, so that many orchards have been planted, growers being assured that if the yellows should appear in neighboring districts, the disease could be stamped out before all their trees would be involved. With but one or two exceptions, it has not been found necessary to put the machinery of the law in operation, as the owners of trees known to be affected by the yellows have shown their good sense, and regard for their neighbors, by voluntarily destroying the diseased trees.

The stimulus given peach culture brought thousands of dollars into this State in 1894. While the peach crop was a failure in Delaware, Maryland, New Jersey and other States, which have heretofore been almost solely depended upon, there were sections of Pennsylvania, particularly in the eastern and central counties, where thousands of baskets of the luscious fruit were produced. This was especially the case in Berks, Lehigh, York, Cumberland, Franklin, Perry, Juniata and some other counties. In Berks county a number of growers had from 2,000 to 10,000 baskets of peaches each, and there were scores of farmers who marketed from 200 to 500 baskets each. Some trees yielded from 10 to 12 baskets. The peach crop in Lehigh county was very large, and a leading newspaper of the county estimated that the growers realized not less than $60,000, mostly from young trees. Hundreds of peach orchards have been planted in that county, the largest covering 120 acres, and containing 21,000 trees.

The attention that has been directed to the importance of spraying fruit trees by the published reports of the State Horticultural Association, the bulletins of the Agricultural Experiment Station issued from the Pennsylvania State College, and by lectures at the numerous farmer's institutes held throughout the State, has been conducive of most excellent results. The quality of apples, pears and other fruits has been greatly improved, and it has been demonstrated that when the trees are given proper care and attention· profitable crops of fruit can be raised in this state, even in seasons regarded as unfavorable. The published formulas of fungicides and insecticides have been of inestimable value to the agriculturists and horticulturists of Pennsylvania. Unfortunately, not all have taken advantage of the important information imparted. Orchards have been so long neglected, and left to care for themselves, that it is a difficult matter to interest farmers sufficiently to make a fight against the insects which are constantly engaged in their destructive work. Many farmers, too, are so much engrossed with other duties that they will not take the time to obtain the materials and make the preparations used in spraying. The expense of providing a suitable outfit also deters some from making the effort to raise salable fruit. Per consequence, much of the fruit offered for sale in the markets of our cities and towns is wormy and defective, and this kind of fruit is even seen competing for premiums at the county fairs. It will, therefore, be apparent that there is an opening in every agricultural district for some enterprising person to engage in the business of spraying trees in orchards and gardens at a certain price per tree; and this business could be extended to the spraying of shade trees, vines and shrubbery.

Possibly the time will come when another law will be enacted to assist fruit growers in the eternal warfare which they are compelled to wage against injurious insects and communicable diseases. Surely, there should be some law to compel the destruction of those familiar pests, the "tent caterpillar," who hang out their banners so conspicuously that there is no excuse for permitting them to exist and multiply. A concerted effort on the part of growers in any fruit should enable them to rid themselves effectually of the ravages of those diseases which appear periodically and cause heavy losses to them in dollars and cents. The growing export demand for American fruit, especially apples, should prompt the farmers of Pennsylvania to unusual exertions to produce a creditable article, and having produced it, to put it on the market in the most attractive form. The fall of 1894 will be remarkable for the large shipments of apples to England, and as this foreign demand is likely to increase with each year, the raising of fruit for market should receive the most intelligent attention. The selection of varieties, and method of packing them, largely determine the profits. Shipping merchants, with a regard for the size of their commissions, have reached the point where they refuse to handle apples unless properly selected and packed. Hence, the importance of growers observing the rules which are not only formulated to protect their own interests, but the good name of the commission houses as well.

New varieties of fruit are being introduced every year, but the old standard kinds continue to be favorites. In almost every fruit-growing section there are native apples which succeed better in that particular locality than varieties brought from other States, or from distant places. Some of these varieties of local cultivation are worthy of general dissemination. The student of pomology will find in the fruit department of any agricultural exhibition new types of apples and other fruit peculiar to the locality in which the exhibition is held. Some of the varieties are of undoubted excellence. He will also, of course, find here and there a standard sort known by some local synonym, and it is no unusual thing to observe varieties mis-named, some of the errors being so palpable as to surprise the observer that such ignorance in regard to the most common varieties should exist.

In the bringing out of new varieties, and the promulgation of information in regard to successful fruit culture, the investigation of the diseases of fruit and fruit trees, and the discovery of methods for the prevention of the ravages of insects, the State Horticultural Association of Pennsylvania, originally known as the Pennsylvania Fruit Growers' Society, has performed a conspicuous part. This society has been engaged in this good work for a number of years, but, unfortunately, has not been sustained as well as it, and its objects, deserved. It should have a large membership in every county, and should, moreever, be the recipient of the State bounty. Its membership is well scattered over the State, but only in a few counties are its members numerous. It is dependent entirely for support upon the voluntary contributions of its members, amounting to one dollar annually from each, in the shape of dues. While other Comonwealths have recognized the importance of granting liberal annual appropriations to the horticultural societies within their borders, our great Keystone State has done comparatively little in that direction. It was believed that the State Board of Agriculture would see its way clear to embrace among its recommendations to the Legislature about to meet, an item for the furtherance of the objects of the State Horticultural Association. A committee appeared before the Board at its last annual meeting in Harrisburg, and the subject was referred to the Committee on Legislation. That committee reported unfavorably, however, at the ensuing summer meeting, held in the town of Somerset, and thus the matter rests. It is to be hoped, in the interest of the fruit growers of the State, as well as for the sake of the thousands of consumers of the products of the orchard and fruit garden, that future efforts may prove successful. California, by a commendable expenditure for the encouragement of fruit culture, has made that the most important industry of the State. Michigan has made rapid strides in the production of fruit through wise and liberal laws. So, too, the fruit interests of Pennsylvania should be guarded and promoted. A little help each year will eventually repay the State one hundred fold.

TUBERCULOSIS AT THE STATE HOSPITAL FOR INSANE, NORRISTOWN, PA.

BY FLORENCE HULL WATSON, M D., *Pathologist of the Hospital.*

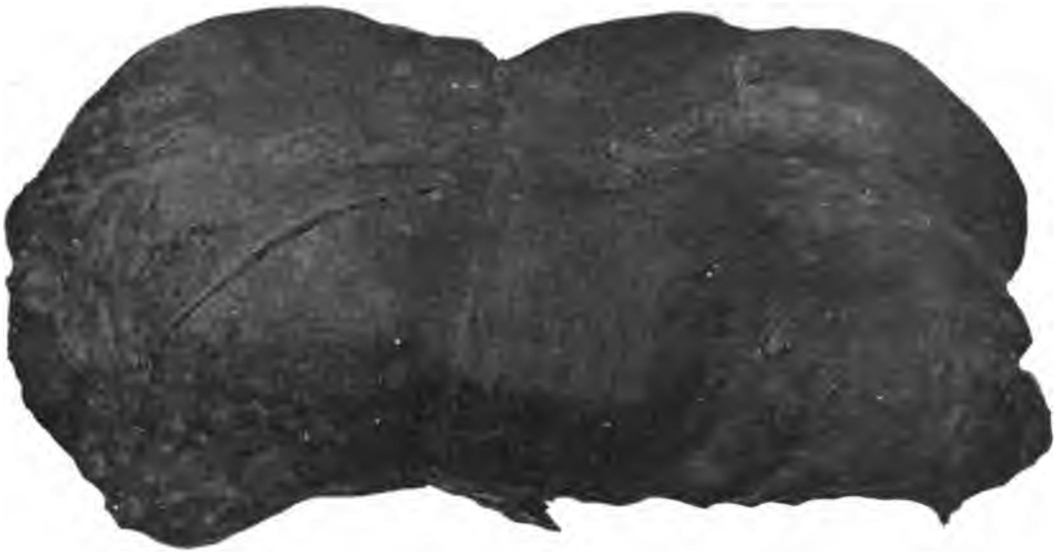
At the request of Thomas J. Edge, Secretary of the State Board of Agriculture, the following notes are presented on the cases of Tuberculosis occurring among the cattle belonging to the State Hospital for the Insane at Norristown, Pennsylvania:

Tuberculosis is so extensively prevalent among cattle at the present day that it is attracting considerable attention,not only from the medical profession but from the community at large, and every effort is being made to find a method that will be fairly reliable in detecting the disease. Physical examination by careful veterinarians is sufficient when the disease is advanced or where the lesions are superficial, but this is useless where it is deeply seated or slight. Since the introduction of Tuberculin in 1891, it has been possible to detect incipient cases of Tuberculosis and much light has been thrown on the disease, its development, distribution, &c., and no doubt it will prove if not an infallible, at least a valuable aid in the diagnosis of this disease.

Early in May the attention of the Trustees of the Hospital was called to the frequent deaths among the cattle and thinking that there should be some definite cause for this they directed that the Pathologist of the Institution from that time on should be present and personally examine all animals either slaughtered or found dead.

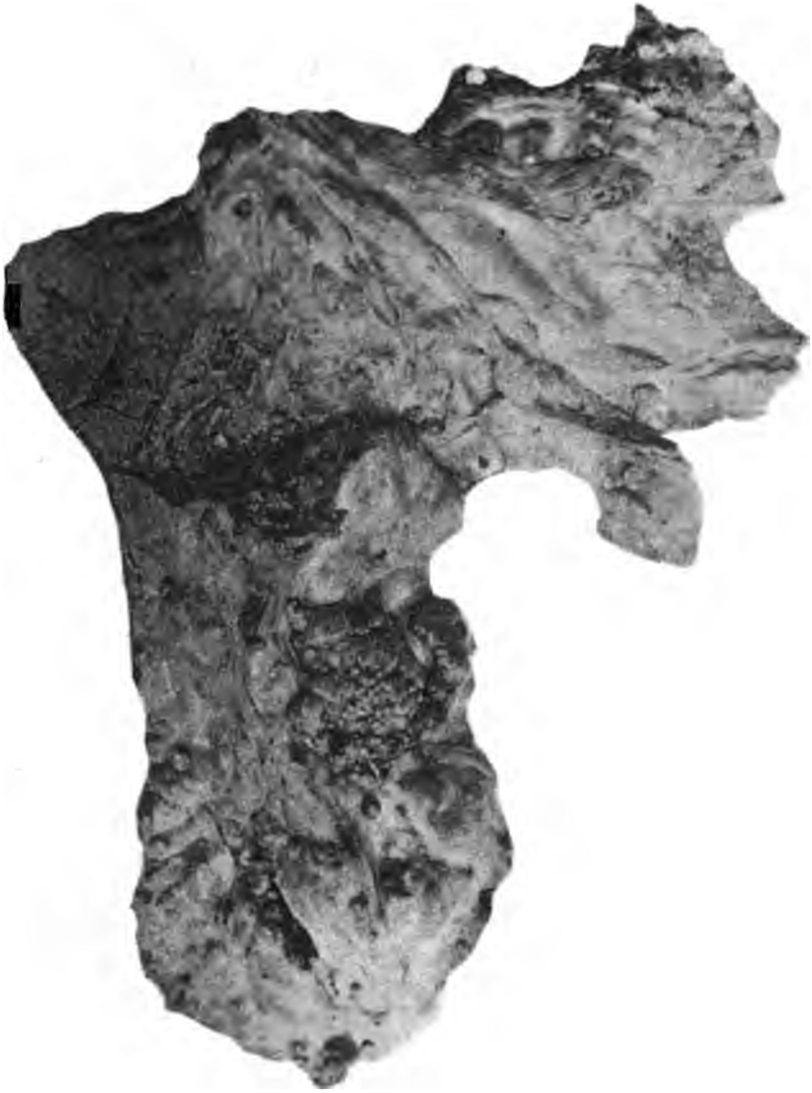
During the month, 9 were examined and in all but one marked Tubercular lesions were found and so reported. The autopsies having revealed such a large percentage of those examined affected, it was deemed highly probable that there would be other diseased animals found among the herd if a careful examination were made.

That this should be done without delay was desirable, not only to prevent the dissemination of the disease to the healthy animals, especially those recently purchased, but for many other important reasons, as the hospital depends on the farm for its milk and occasionally for its meat supply. The amount of the former consumed is large, many of the patients making it the chief article of their dietary and it is certainly important that this milk should be furnished them in as pure a state as possible. The general health of the insane is as a rule poor and the relation of general diseases to insanity is recognized by all, as well as that their poorly nourished tissues form a favorable soil for the development of the germ of Tuberculosis. When one considers that the largest percentage of deaths in institutions for the insane is due to Tuberculosis every effort should be made to limit the sources of infection as far as possible. The milk of Tubercular animals has been considered a source of infection by many and the consensus of opinion is that Bacilli of Tuberculosis are present in the milk sometimes at least, and of course the greater the number of diseased animals in the dairy supplying the milk the greater the danger that the germs may



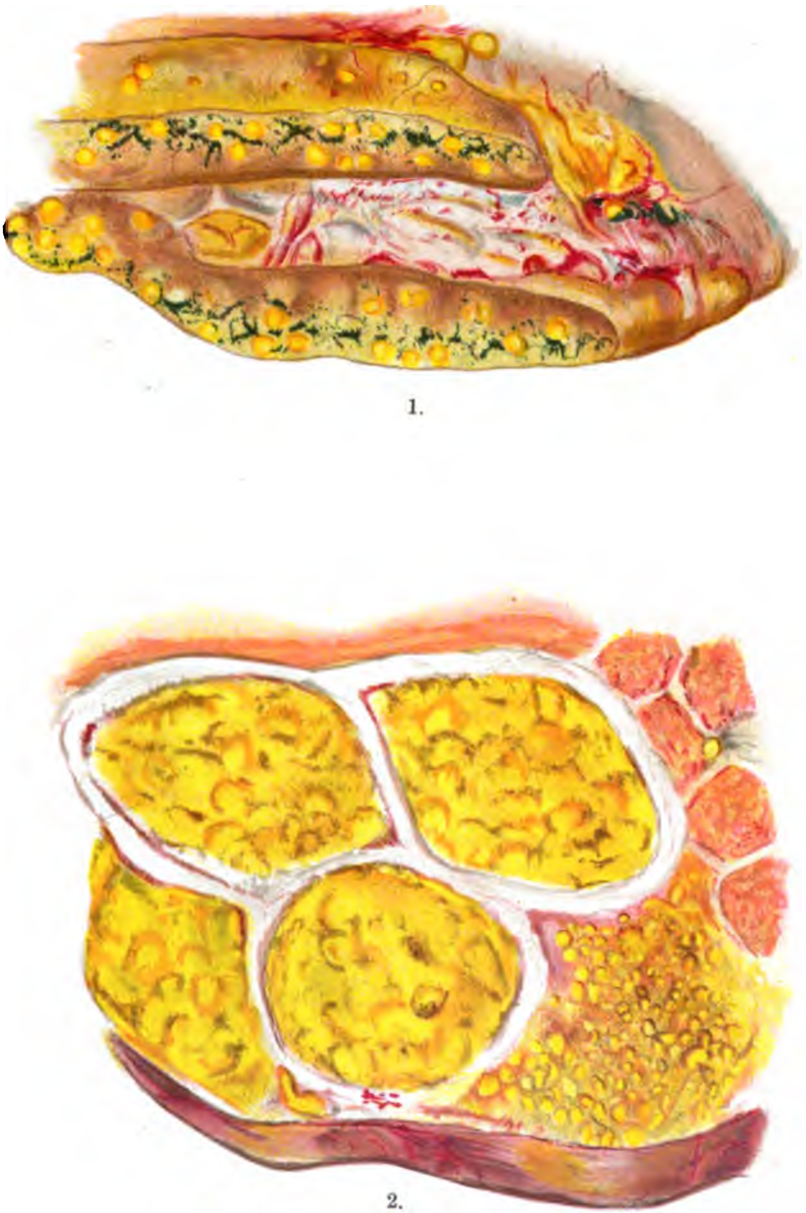
TUBERCULOSIS.

Liver of Cow, No. 88, Asylum Herd. Weight 48 pounds.



TUBERCULOSIS.

Anterior and portion of middle lobe of right lung of Cow, No. 6, Asylum Herd.



TUBERCULOSIS.

1.—Lower posterior mediastinal gland,(slightly enlarged), containing tubercular nodules in the early stage. 2.—Portion of Left Lung—Lower lobe. From Cow No. 96—Asylum Herd.

be present. Then the toxines present in the milk would do much to accelerate Tubercular processes if already existing.

As to the best method of examination Secretary Edge was consulted and his advice was that the entire herd be tested with Tuberculin. The Trustees having decided that this be done the work of inoculating the animals was at once commenced and very carefully carried out at seven different dates by Dr. Francis Bridge, State Veterinarian, assisted by Dr. Samuel Bickel, of Norristown.

For a full report of these tests reference should be made to the articles of Secretary Edge and Dr. Bridge and also to the Special Report published by the Hospital at Norristown.

A brief resume will be given here of the number infected, condemned, &c., in so far as they have bearing on the amount of disease present or the character of the lesions.

Altogether there were 233 injections of Tuberculin representing 183 individual animals; of these 135 were condemned as being diseased. Besides these 12 others were condemned by physical examination making a total of 147 animals condemned to be killed.

The autopsies took place as soon after condemnation as possible; all organs were removed and examined whether diseased or not and notes were taken at the time of examination. The brain was removed only in the worst cases; the method of killing the majority of the animals (shooting) rendering its removal in all cases impossible from the destruction of tissue. Tuberculosis of the brain is rare, however, and undoubtedly the animals would have manifested some symptoms during life as in the one case hereinafter mentioned.

The pelvic viscera were examined in all cases as well as the udder; all segments of the latter being incised. Specimens of the different diseased areas as well as deposits that were somewhat doubtful were retained for microscopical study; the usual methods of hardening and infiltration were employed and the sections obtained thus were stained generally as well as specially for Tubercle Bacilli. The result of the autopsies showed that not a single animal reacted but that was more or less diseased; the deposits in a few of the cases required a careful search but they were always demonstrable. That the results of the test were so favorable was undoubtedly due to the care with which it was applied, eliminating all cases of doubt until they had been retested. And yet, notwithstanding this care, 4 animals failed to react which were Tubucular. Three of these had quite marked lesions, one was but slightly diseased; the deposits were as a rule firm, sharply defined from surrounding lung tissue with a central focus of softening though some were decidedly broken down, especially those large masses formed by the coalescence of a number of small nodes. None showed calcareous deposits or other evidences of quiescence. From these cases, as well as from the failures reported by other observers who were undoubtedly just as careful, we must, I think, look on Tuberculin as a valuable diagnostic aid only.

Breed: The greater number condemned were common cows—67—autopsies of these showed more or less marked lesions present in every case and that as a rule animals on the place less than one year were least affected. Next came Holsteins, 23, of these 17 were over 5 years of age, 1 was 4 years and the balance were under 3 years as will be noted in Table No. 1. Grade Holstein 20 in number—of these 18 were raised on the place and of these latter 16 were under 3 years. Jerseys, 10; 5 being 3 years and under. The remaining animals were mixed Jerseys 9 and mixed Durhams 8—making a total of 147 animals.

Table No. 1 gives the ages and amount of disease present in the Holsteins, Grades and Jerseys of three years and under. It has been noted with some surprise that in this herd the young animals have been as a rule among those most markedly diseased, differing somewhat from the observations of others that the disease increases with age of animals That such a large percentage of the young animals were diseased in this herd is undoubtedly due to the transmission of some taint from generation to generation that rendered them peculiarly susceptible to the germ of Tuberculosis. It has only been possible to trace the family history of the young Holsteins and of these 3 had both parents tubercular. In three (3) other cases the bull had been diseased (markedly) and in six (6) others the cow was affected. Inbred families are peculiarly susceptible to tuberculosis, intensifying as they often do personal and family characteristics. These young animals were kept under fairly good hygienic surroundings—spending most of their time in what is known as the "new barn;" here the ventilation is good, light, especially sunlight entering readily; notwithstanding this there must have been more or less contamination of the air when one considers the number of tubercular animals occupying the stable. These young animals possibly might have withstood it longer had their tissues been better and their powers of resistance greater. In the course of these investigations it has been my province to inspect quite a number of young calves, Holstein and Grades, and it was noted that the mesenteric glands were almost invariably larger than is usual and in many cases much softer. Besides these the Posterior Mediastinal chain of glands have also been frequently enlarged; the lungs badly inflated and the blood supply poor, especially noticeable in the lower posterior portion of the caudal lobes. There were no evidences of disease in any of these cases macro or microscopically. These animals were but a few weeks old and spent most of their life in the box stalls. During the autopsies on the condemned animals quite a number of embryoes were removed and examined and in all them a similar condition was present. The lowered vitality of the cows coincident with diseased processes affecting the animals in utero undoubtedly as it does in the human being. Insufficiently nourished, the tissues are not endowed with that resistance that is necessary for the successful combat with diseased germs; especially when the animal takes its place in a stable where the air is more or less vitiated at all times by a number of tubercular cattle. Then too in the earlier days of its life this young animal is nourished by the milk of its mother and if this milk is impure there is another factor added to the many extant which cause the infection of an animal with susceptible tissues.

In the cases examined here there are none that will add positive evidence to the direct transmission of Tuberculosis from mother to offspring; none of the embryoes having lesions of any kind.

The only case in which there was doubt as to the mode of infection, and which might be considered congenital by some, was in the case of a calf—3 weeks old—the mother had been condemned by physical examination and was placed with five others similarly condemned in what has been designated the "suspect" barn and here she gave birth to the calf, a weak, miserable one. Shortly afterward she was injected with Tuberculin. Her average temperature before injecting was 103 degrees and 14 hours after inoculating her temperature was 105 degrees, making amount of reaction above maximum of previous day, 1.8 degrees. The autopsy took place 10 days later and showed both lungs badly diseased. also the bronchial glands.

The calf spent the greater part of its existence in this barn and was fed by the mother. It was killed when three weeks old and there was a caseous focus found in lower posterior mediastinal gland. The upper glands were enlarged, as were also the mesenteric, but these were not diseased. The deposit was of medium size, with a central focus of softening, sharply defined from surrounding glandular structure. Development and caseation of a deposit of this size in 3 weeks would be remarkably rapid but same allowance may be made for the environment and health of mother.

From this table it will be seen that 34 animals had the lungs diseased; of these 9 had deposits in right lung only, 2 in left lung only and that 23 had deposits in both.

Bronchial Glands—Four had left only diseased; all bronchial glands involved in 22; total diseased being 26.

Anterior mediastinal glands and Pericardium affected in 6 cases; Posterior glands diseased in 34 cases, of these 26 were markedly affected (very much enlarged, usually filling in the space between the lungs—glandular structure more or less destroyed and complete infiltration not only of gland but also of surrounding tissue). Costal Pleurae affected in 6 cases. The Liver in 8 and the hepatic glands only in 5 cases. Mesenteric glands 5, Parotid and Posterior Pharyngeal in 3. The intestines were involved in one case. No. 38, not only nodules, but also numerous tubercular ulcers, chiefly situated in the lower portion of the small intestine. This was one of the worst cases in the herd. The disease was marked throughout the body, the lungs were so infiltrated that there was but little breathing space left and it was a wonder that the animal lived and looked in such good condition. Except that it was small for its age none of the outward appearances gave evidence of the ravages that the disease had made internally. The pericardial sac was obliterated, a thick deposit nodular and caseous in character extended down to the heart muscle. (During May there was a Grade 4 years of age that had a similar condition of the epi-and peri-cardum). The Spleen had deposits and the left Supra-Renal Capsule was seat of a number of nodules.

Distribution of disease in young animals:—

TABLE NO. I.

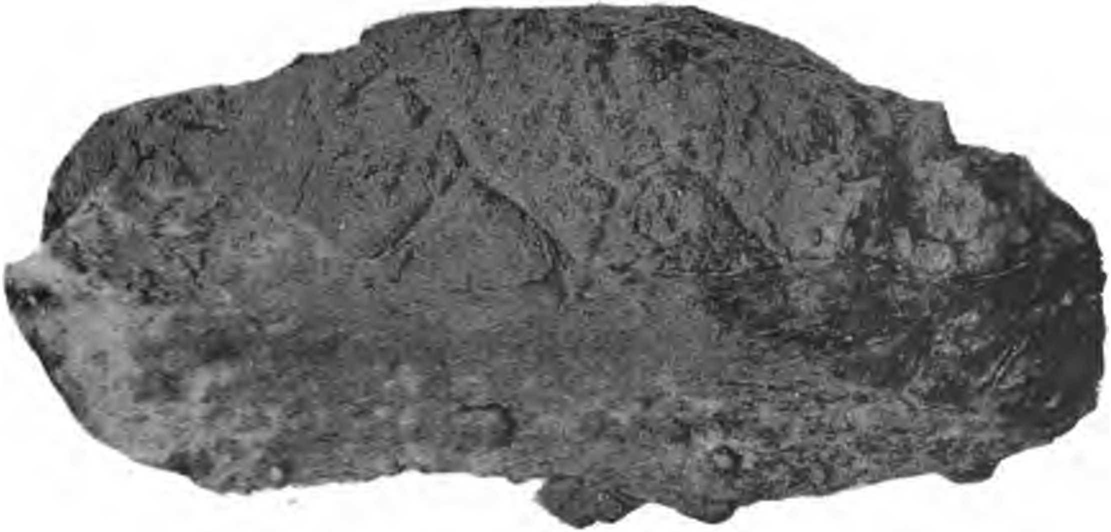
H.—Holstein; J.—Jersey; G.—Grade Holsteins.

—. Slight deposits, in early stages.

0. Medium number of deposits in later stages or else number of deposits scattered throughout in early stages.

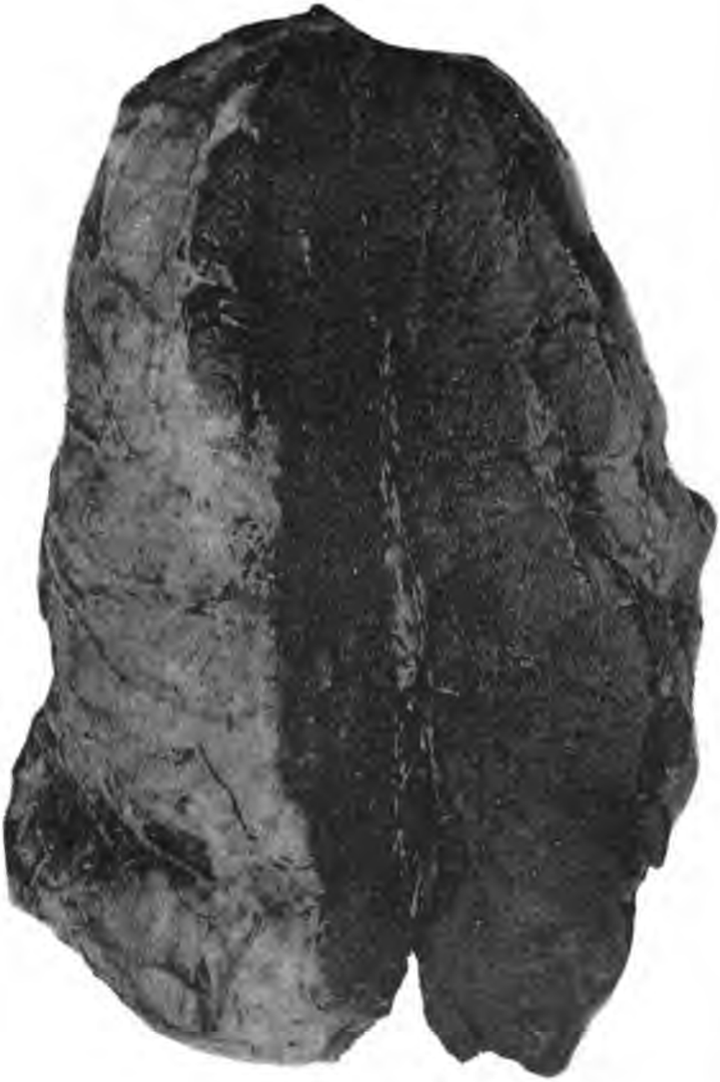
*. Marked cases—In these the infiltration and caseation was very marked. Deposits were large and much broken down.

Number.	Breed.	Age.	Reaction.	Lungs.		Bronchial Glands.		Anterior Mediastinal glands.	Posterior Mediastinal glands.	Pleurae.	Liver	Hepatic glands.	Mesenteric glands.	Posterior Pharyngeal glands.
				R.	L.	Left.	Others.							
46	H.,	8 months,	5.2	—	0	*	...	...	*	*	...	...	...	...
A..	J.,	9 months,	P.,	—	*	*	...	*	*	...	*	*	...	...
112	J.,	11 months,	2.6		0	0	0	...	*	...	0	...	...	...
113	J.,	"	3.2	0	...	...	...	...	*	...	...	...	...	...
106	J.,	15 months,	5.2	0	...	...	...	...	*	...	...	...	...	...
108	H.,	1 year,	2.6	0	...	...	...	...	*	...	...	...	...	...
110	H.,	"	4	*	*	*	*	...	*	...	...	...	...	...
111	H.,	"	3.2	*	...	...	...	...		...	...	...	*	...
B.,	H.,	"	P.,	*	*	*	*	0	*	*	...	...	*	...
119	H.,	"	4	0	...	0	...	...		...	...	...	...	...
109	G.,	"	3.8	*	*	*	0	...	*	...	...	*	...	...
53	H.,	2 years,	3.6	...	*	...	...	...	*	...	0	...	...	...
54	H.,	"	3	...	*	0	0	...	*	...	*	...	...	...
55	H.,	"	4.2	...	...	...	...	...	...	...	*	*	...	...
103	H.,	"	5.6	0	*	0	...	...	0	...	...	...	...	...
56	G.,	"	4.8	*	0	*	*	...	*	...	...	...	0	...
57	G.,	"	3.8	*	...	*	*	*	*	*	...	...	...	...
58	G.,	"	5.8	*	—	...	...	...	0	...	...	*	...	—
59	G.,	"	4.4	*	0	0	0	...	0	...	...	...	...	...
60	G.,	"	4.2	*	0	0	0	—	*	*	...	...	...	...
61	G.,	"	4.2	*	*	*	*	...	*	...	...	...	...	...
115	G.,	"	2.4	*	*	*	*	...	*	...	*	*	...	...
48	G.,	2½ years.	5	*	0	*	*	...	*	...	...	...	...	...
51	G..	"	4.8	4	*	*	*	...	*	...	—	...	*	*
62	G.,	"	3.6	0	—	*	*	*	0	*	...	...	...	...
63	G.,	"	4.4	*	*	*	*	...	*	...	...	...	...	...
64	G.,	"	6	*	*	0	0	...	*	...	...	...	...	...
43	H.,	"	4.6	0	...	*	*	...	*	...	...	...	...	...
65	H.,	"	3.6	*	0	—	0	...	0	...	...	...	...	...
78	J.,	3 years,	2.4	*	*	*	*	*	*	*	*	*	*	*
76	H.,	"	4.8	*	*	...	...	...	...	...	...	...	...	...
104	H.,	"	3.4	0	...	—	—	...	0	...	...	...	...	...
106	H.,	"	5.8	0	0	0	0	...	*	...	...	...	...	...
114	G.,	"	3	...	...	...	...	...	*	...	...	...	...	...
121	G.,	"	4.4	0	—	...	...	...	0	...	...	...	...	*
117	G.,	"	4.6	*	...	*	*	...	*	...	...	...	...	...



TUBERCULOSIS.

[illegible] lobe of right lung of Cow, No. 81, Asylum Herd.



TUBERCULOSIS.

Lower posterior mediastinal gland—right side, Cow, No. 75, Asylum Herd.

Those marked A and B were not injected with Tuberculin but were condemned by physical examination.

No. 105 and 104 were resident 1 year; all the others were raised on the place.

Sex: There were 12 bulls injected; of these 11 were condemned; the lesions found at the autopsies were similar to those in the cows—some marked and others medium. With exception of 3 Jerseys they were all Holsteins and the one that escaped condemnation was the youngest being but one year old. His family history is bad—parents both being Tubercular and their other offspring were diseased.

The percentage of bulls condemned is high with reference to number only, but the observations that bulls are not so frequently diseased as cows is also seen in this herd if reference be made to total number of those condemned. Of these 75.51 per cent. were cows and 7.48 per cent. were bulls; heifers and calves making up the balance.

In these animals the generative organs were carefully examined but they contained no deposits, not even in the case of No. 38, Jersey bull, which was so extensively diseased.

Relation between high temperature and amount of disease.

From observations made in the cases of the hospital there does not seem to be the relation between the temperature and the amount of disease claimed by some, who say that a high reaction following injection of Tuberculin indicates slight disease or at least not very extensive.

In 33 cases where temperature rose as high as 108.4 the majority were marked cases and 10 were among the worst that were examined.

Of these 33 animals, 8 were 3 years and under; 19 more were between the ages of 3 and 8 years and 6 were eight years and over.

In examining Table No. 2 and 3, it will be seen that none of the cases could be regarded as slight (having one or two deposits only and these small and still firm). One did not have the lungs diseased but there were some deposits in the posterior mediastinal glands—the mesentric glands were badly affected and there were a few deposits on the intestine close to the mesenteric attachment which were decidedly caseous. This was undoubtedly a case of infection through the alimentary tract and was one of the best examples of that mode of infection observed in the hospital cases.

From an examination of these tables, I think one is justified in saying that there can be no definite rule laid down as to the relation of high temperature and amount of disease. Also many observers have remarked that badly diseased animals often fail to give a high reaction to Tuberculin, in some cases not even enough to condemn them, and this has been noted among the Norristown Hospital herd in several cases. In such cases one has the aid of physical examination and also in some the average temperature taken the day previous to inoculation may be so high as to be suspicious and to render a retesting advisable.

TABLE NO. II.

Animals having temperature of 108 degrees and over.

Case number.	Breed.	Age.	Period of residence.	Maximum temperature after examination.	Number of hours to maximum temperature.	Amount of reaction.	Lungs.		Pleurae.	Bronchial Glands.		Anterior mediastinal glands and pericardium.	Posterior mediastinal glands.
							R.	L.		L.	Others.		
64	Grade, . .	2½ yrs.,	2½ yrs.,	108.4	12½	6	•	•	•	•	•	. . .	•
27	Common, .	6 years,	1½ yrs.,	108	12	6.6	•	. . .	. .	•	•	. . .	0
71	Common, .	7 years.	2 yrs.,*	108	10	6.6	•	0	. .	•	•	. . .	. . .
116	Holstein, .	8 mos.,	8 mos.,	108	8	5.2	—	0	•	•	. . . . .	•	•

Brain.

Among the animals examined was one in which the brain and meninges were diseased and as Tuberculosis of the central nervous system is rare, a short account of this case will be interesting, not only for this reason, but from the fact that the animal manifested symptoms during life that were largerly referable to some disturbance of the brain and also that the autopsy showed the miliary character of the lesions. This would indicate either an extensive bacillary invasion or a rapid dissemination by means of the blood current.

Holstein, four years of age; apparently well up to a few days before she was killed, probably ten. First symptom that was noticed was that she staggered on standing and that she was losing appetite; when seen two days prior to death she could rise with great difficulty only and after repeated urging; the next day this seemed impossible as urging elicited a slight movement in the legs only which were doubled up under her. Facial expression anxious, breathing extremely labored, marked movement of alae of nose, swallowing seemed at first difficult, later impossible. Skin dry and hot. The next morning she was killed and examination showed that the following conditions were present.

Brain: In left Corpus Striatum and Optic Thalamus were three (3) small nodules, largest size of small pea; projecting slightly into ventricular cavity; or section seen to extend some distance into substance of Basil Ganglia, they were gray-white in color and sharply defined and firm. In Right Optic Thalamus there was a similar spot, size of pin-head.

Pia-Arachnoid adherent to cortex in places; entire membrane studded with miliary tubercles especially numerous at the base of the brain. Whole membrane clouded, vessels injected. The tubercles averaged about the size of a pin-head, were firm, gray-white and projected slightly above the surface.

TABLE NO. III.

Animals having temperature of 107 to 107.8 degree.

Case number.	Breed	Age.	Period of residence.	Maximum temperature after injecting.	Number of hours to maximum.	Amount of reaction.	Lungs.		Amount of mediastinal glands.	Bronchial glands.	Posterior mediastinal glands.	Pleural.	Liver.	Hepatic glands.	Intestines.	Mesentinc glands.	Abd. pentmeal surfaces.	Post. pharynjeal and parolid.
							R.	L.										
5,	Mixed Jersey,	5 years,	—2 years,	107	13	5.8	—				0		0					
6,	Mixed Jersey,	6 years,	—2 years,	107	13	5.2		—	—	0	0							
7,	Common,	9 years,	2 years,*	107.4	13	5.4	—	0			0							—
9,	Durham,	8 years,	2 years,*	107	13	4.2	—	*		—	0							*
13,	Durham,	6 years,	—2 years,	107	11	4.4	*	—		0	0							
14,	Durham,	8 years,	2 years,*	107.8	12	5.8	0	—		—								
15,	Common,	7 years,	-2 years,	107.4	13	5.6	*	0		0	0		0					
29,	Common,	7 years,	2 years,*	107	13	5.8	*	0		*	*							
39,	Holstein,	9 years,	2 years,*	107	13	6					—		*	*	—			
45,	Holstein,	5 years,	3 years,*	107	12	6	*	*		*	*	*	*	*		*		
48,	Grade,	2½ years,	2½ years,	107	12	5	*	0		*	*							
52,	Grade,	6 years,	—2 years,	107	12	6	—	*		*	*		*	*				
56,	Grade,	2 years,	2 years,	107.2	13	4.8	*	0		*	*	0				0		
58,	Grade,	2 years,	2 years,	107	13	5.8	*	—			0					*	—	
66,	Common,	8 years,	2 years,*	107	13	6	0	*		*	0		*	*			—	
67,	Common,	9 years,	2 years,*	107.2	12	5.8	*	*	—	—	*	*		0				
68,	Common,	5 years,	1 year,	107	12	5.6	0	0			*	*	*					
70,	Common,	6 years,	1 year,	107.4	14	5.4	—				0						*	
73,	Grade,	7 years,	2 years,*	107.4	14	5.4	0	*		*	*	*	*	*				
75,	Common,	11 years,	2 years,*	107.4	12	6.4	0	0		0	—			*				
81,	Common,	6 years,	2 years,*	107	12	5	0	*			0							
88,	Mixed Durham,	5 years,	2 years,*	107.2	12	5.8		0		0	*						*	
96,	Common,	8 years,	2 years,*	107	13	4.6	*	*		0	*							
97,	Common,	10 years,	2 years,*	107.2	13	4.6	*	*		*	*	*						
99,	Common,	5 years,	1 year,	107.2	12	6.2	*	0		*	*							
103,	Holstein,	2 years,	2 years,	107	10	5.6	0	*		0	0							
106,	Holstein,	3 years,	3 years,	107.2	12	5.8	0	0		0	*							
110,	Holstein,	1 year,	1 year,	107	13	4	*	*		*	*							
126,	Mixed Jersey,	11 years,	7 months,	107	15	5.8	—			*	*		*					

Spinal cord and its meninges microscopically no change.

Lungs: All the different lobes were studded with nodules varying in size from a pea to a marble. Many of them were still firm but a few, especially the large ones, showing signs of central softening. The small nodules were the most numerous and were not as sharply defined as the larger ones which were formed by the coalescence of a number of the small ones. They were also gray-white in color—where as the large ones were yellow from the extensive caseation present. There were numerous fresh adhesions of the lungs to the costal pleurae and at a point just above diaphragm right side, posteriorly there was a small pocket of pus. Bronchial and mediastinal glands enlarged, contained numerous foci—all small and just beginning to caseate—Liver two grape-sized deposits in parenchyma of liver, just beginning to break down. Hepatic glands enlarged, contained number of caseous nodes.

Intestines—entire length of small intestine studded with miliary tubercles similar in character to those on pia-arachnoid; these deposits were also present in large intestine but not so extensively. The peritoneum between these little nodules clouded. Mesenteric glands caseous deposits, the mesentery itself also studded with miliary tubercles averaging about the size of a pin head. These deposits were found also on the Parietal Peritoneum but few in number however. Abdominal cavity contained considerable cloudy fluid with flakes of lymph.

Distribution of disease in lungs was as follows: Both lungs affected in 92 cases, right alone in 21, left alone in 16, total, 129 animals out of the 147 condemned had diseased condition of lungs.

Of the 92 having diseases of both lungs, there was some little difference as to which side was chiefly affected. In 23 cases the most marked lesions were found on the right side and in 26 on the left. Both lungs equally diseased in 43 cases. Most observers seem of the opinion that if any one side is specially susceptible it is the left. In the hospital cases where one lung only was diseased the greater number occurred on the right side. Yet when reference is made to the figures of both lungs, it will be seen that the numbers are almost equal, leaving out of consideration those cases where the disease was equally distributed to both.

The large caudal lobes were involved in 123 animals. Both caudal alone in 18 cases. Both caudal and other lobes in 63 cases. Right caudal only 12 cases; combined with other lobes, 8. Left caudal only in 10 cases, with other lobes in 12 cases. The remaining 6 cases, in which other than caudal lobes were diseased, are divided as follows: Both cephalic and ventral lobes, 1; right ventral and cephalic, 1; right cephalic only, 2; left ventral only, 1; right ventral only, 1.

From the above statistics it does not seem deducible that the caudal lobes are always the primary seat of Tuberculosis. Sixty-three of these cases had other portions diseased than caudal lobes only and in many of these the disease was equal in age and distribution, so that it was impossible to say just which lobe contained the primary focus, not only because the disease was so extensively distributed, but also because several different areas could be infected at about the same time.

In many of the cases where the caudal lobes were diseased the lower posterior border seemed to be the seat of the most advanced lesions. Again quite a number had marked deposits at the junction of lower with upper lobes. It would seem also that in the cases where the cephalic or ventral lobes are attacked that the disease is more destructive there than in the caudal lobes; the deposits are as a rule smaller and the coalescence of these into masses of large size as in caudal lobes not as frequent as is the complete infiltration of lobe with small deposits. The caseation of these nodules is not so marked and there appears to be considerable shrinking—due possibly to their being less expansile than the lower lobes and also to the large amount of connective tissue growth. In only a few of the cases has the caseation been marked in the cephalic lobes, more frequently however in the ventral, especially at their junction with caudal lobes.

The development of Tuberculosis in the lungs of these animals seemed to be entirely independent of any pre-existing disease of lungs and with exception of two or three cases where the lungs were Emphysematous there were no lesions found at the autopsies other than Tubercular.

As to the amount of Tuberculosis present it is difficult to divide the cases in such a way as to be accurate; many stages being represented in a single case sometimes. Forty-three of the 129 had slight lesions in the lungs; by this is meant either one or two medium-sized deposits or several small ones in early stage. These 43 were divided into: Both lungs in 9; Right only 15; Left only 5. Right slight and left more marked in 7. Left slight and right more marked in 7.

Sixty three were markedly diseased; among these are included cases where there was one or at most two large deposits present, or where there were numerous small ones. All more or less caseous; of these 36 had both lungs marked: right, only 5; left, only 7; right marked, left fad 9; Left marked, right bad 6.

Twenty-three were extensively diseased, among these are included complete infiltration of lobes, or where there are several large deposits, all actively retrograding; of these right lung only in 1. Left in 4 and both in 18 cases.

The deposits when first formed are gray-white in color, small, rounded or ovoid in shape; hard and firm, situated in a vascular area. Soon they enlarge, coalesce and form a nodule which is readily recognizable. The central portion undergoes caseous degeneration which gives the nodule a bright yellow appearance; the firm nodule soon disappears and the soft cheesy substance occupies the whole surrounded by a connective tissue capsule, more or less marked which defines its shape from the surrounding lung tissue. This is formed by the efforts of the phagocytes to limit the disease and render it harmless. In other cases there is not sufficient time for this; the nodules spread, coalesce with others and so infiltrate a considerable area.

By the coalescence of these nodules large masses are sometimes formed, in the lung substance or superficially. In some of the cases there have been masses larger than oranges, and in others a very small breathing space is left, the infiltration being so great.

Bronchial Glands.

These were diseased in 97 of the cases; associated with a diseased condition of lungs in 95, and in 2 only were glands affected and not lungs.

In one of these latter the left bronchial gland alone had deposits associated with disease of the posterior mediastinals and liver. In the other case bronchial glands were involved with posterior mediastinal glands.

Of the 57 cases asociated with disease of lungs, 77 were in combination with disease of both lungs, 10 with left lung and 8 cases with the right lung.

In 34 cases the glands were healthy while there was disease more or less marked in the lungs. Of these, left lung 6 cases; right in 13 and both lungs in 15.

Both bronchial glands were diseased in 79 cases, left only in 14; right and others in 4. The lesions were slight in 26; more marked in 46 and in 25 were very bad. In these latter all glandular structure had disappeared, the glands were very much enlarged, and the contents as a rule were semi-fluid.

Of the 14 cases in which left gland was only one diseased it was associated with lung disease as follows:

Left gland with left lung,	8
Left gland with right lung,	1
Left gland with both lungs,	5

In the 4 cases in which the right was diseased chiefly it was invariably associated with disease of both lungs, and there were no deposits in left bronchial gland.

Posterior Mediastinal Glands.

These were diseased in 134 cases, in 4 cases they were the seat of only tubercular deposits in animal. They were associated in 122 cases with disease of lungs. Both lungs in 87 cases, with right only in 21 cases and with the left in 14.

In two cases it was associated with disease of Bronchial glands, in one case alone with this. In the second the liver was also diseased.

In two cases disease of the abdominal serous surfaces was associated with mediastinal glands in having the only deposits.

Liver with posterior mediastinal glands diseased in 3 cases, and in one case the udder and posterior mediastinal glands were the seats of disease.

The mediastinal glands alone were diseased in 4 cases.

As a rule the entire chain was involved but in 18 cases, the lower glands only were diseased. The lowest of the chain of glands was frequently bifurcated at its upper extremity, there were several cases, however, in which the separation into two glands lying side by side was distinct. In many of the specimens the deposits appeared on section as bright yellow dots of various sizes scattered along the margin and in the substance; they were sharply defined and all the more prominent from the darker pigmented back-ground. These coalesced and increased in size until finally all glandular structure was obliterated, making some of these glands very large. A number were removed the size of a cow's kidney, and one was twice as large, weighing 5½ pounds. Many of them on section were soft and caseous, with the central portion so degenerated that it consisted of semi-fluid contents only, others, on the other hand, had undergone calcareous infiltration and were hard and firm with a few foci of softening only.

The upper glands were as a rule not so severely diseased nor did they reach such a size as the lower ones; In many of the cases the infiltation and enlargement was so great that the space between the lungs was obliterated.

Slightly diseased in 18, more marked but not extensive in 29 (glandular structure, still visible). Extensive infiltration in 44, and in 43 they were very much enlarged, tissue in neighborhood infiltrated, none smaller than child's kidney.

Anterior Mediastinal Glands.

Involved in 13 cases, always associated with disease of posterior mediastinal glands, lungs, or bronchial glands, and in many of the cases with pearl disease of costal pleura. In nearly all of these cases upper portion of the pericardial sac was diseased also and in a few the infiltration was so extensive as to obliterate the sac and involve epicardium, as noted elsewhere.

Costal Pleurae.

Diseased in 23 cases. Both sides in 10 cases, left side only in 3 and right only in 10. The deposit in the greater majority of cases was marked, in two especially in which the deposit on the pleura was the only demonstrable lesion it was so large as to seriously impair the function of the lung of that side. Besides these large masses there were many deposits of those pearl-like bodies. Also numerous adhesions to the lungs, due to inflammatory irritation set up by the nodules when they are more or less superficial. In many of the cases where the costal pleurae was involved the adhesions were so firm and the deposits so thick that it was impossible to state positively just where one ended and other began.

The large masses of deposits noted above were usually situated just above the attachment of the diaphragm posteriorly; they were hard nodular as a rule, although a few showed signs of central softening. In several of the cases besides these there were small pockets of pus situated at about the same location.

Glands of Neck.

Affected in 13 cases only, associated with disease of thoracic viscera only in 8 cases and with disease of both thoracic and abdominal viscera in 5 cases. The posterior pharyngeal glands were involved in 9 cases; and in 3 the right parotid was the seat of disease; and in one the left parotid. These reached a large size and were completely infiltrated, the centre being soft, cheesy matter only, all glandular structure having disappeared. In two of the cases where the posterior pharyngeal glands were involved the submaxillary glands also contained caseous foci.

Muscles.

There were evidences of deposits in 3 cases; 2 affecting the psoas muscle, left side; here the deposits were about the size of grapes, soft and caseous. There was marked disease of all thoracic and abdominal viscera as well, one of these cases was the young Jersey bull, No. 38, already mentioned. In the third case the deposit was in the fascia of the Pectoralis Major Muscle, was about the size of a small pea, still firm, although there was a central focus of softening but not marked. In this case extensive disease of the thoracic viscera and neck glands, wes present.

Thyroid gland, seat of deposits in one case.

Liver.

Diseased in 43 cases; of these the deposits were slight in 15. More marked in 20 in which probably there would be one lobe affected containing three or four nodules of considerable size and in 8 the disease was very extensive involving entire lobe at least and in several cases both lobes. The largest liver removed weighed 48 pounds. It was 25 x 17 x 7 inches, and was completely infiltrated with nodules of various sizes and in different stages. Besides this organ both lungs and mediastinal glands were badly diseased and there were deposits in the spleen. In nearly all the bad cases the hepatic glands have been involved also. These had deposits in 24 cases. In 6 there were diseased foci in the mesenteric glands as well.

The mesenteric glands were involved in 14 cases altogether associated as has been noted with the hepatic in 6 Also the intestine was involved in 9 cases, associated with disease of mesenteric glands. in every case. In several of these there were numerous tubercular ulcers as well as nodular deposits in the intestines, the latter on section were caseous. In the 9 cases noted there could be no mistake as to the character of the lesion and in all but one, there were marked lesions throughout the body; this one case has already been referred to as having marked deposits in mesenteric glands and few in mediastinal.

Spleen had tubercular deposits in 5 cases, these were situated as a rule in parenchyma and were small.

Kidneys: Two cases had small nodules of a tubercular character; these cases were associated with marked abdominal lesions and caseous foci in renal glands. Besides these two the renal glands were affected in 5 cases making total of 7 cases. Supra-renal, capsule diseased in 1 case, already mentioned.

Caul or omentum contained deposits more or less marked in 7 cases and the parietal and visceral peritoneum was diseased in 10 cases.

As regards the uterus and appendages 3 cases only were diseased, but these were marked ones. Involving in one case all the pelvic viscera; infiltration and caseation being extensive. This animal had been sterile for over 3 years. In the other two, left horn of uterus and ovary were involved, this was also marked. In these cases where the organs of the pelvis were involved it was impossible to state positively the original primary focus of disease as all the organs and serous surfaces were so diseased.

Udder: Was diseased in four cases (4), in three of these the deposits were small, firm and sharply defined. In the 4th case caseation was extensive. In one case the disease in the udder and deposits in the posterior mediastinal glands were the only evidences of disease present.

In conclusion, of the 147 animals condemned and killed the disease was distributed as follows:

Thoracic viscera, in	87
Abdominal viscera only in,	3
Both abdominal and thoracic viscera in,	57
	147

FERTILIZER BRANDS AND THEIR MEANING.

By the SECRETARY.

The farmers of our State expend each year from $3,750,000 to $4,000,000 for commercial fertilizers, and it is perfectly safe to estimate that of this amount, they, by a failure to make themselves acquainted with the meaning of the brands upon fertilizer sacks, lose each year at least $750,000, and this without fraud on the part of the manufacturers.

The Act of June 28th, 1879, section 1st, provides: "That every package of commercial fertilizer sold, offered or exposed for sale for manurial purposes within this Commonwealth, shall have plainly stamped thereon the name of the manufacturer, the place of manufacture, the net weight of its contents, and an analysis stating the percentage therein contained of nitrogen, or its equivalent in ammonia in an available form, of potash soluble in water, of soluble and reverted phosphoric acid, and of insoluble phosphoric acid."

Section 4th, of the same Act makes it the duty of the Board of Agriculture to carry the Act into effect, and for this purpose the Board, at proper seasons of the year, keeps from six to eight special agents traveling over the State selecting samples from all lots of commercial fertilizers which they may find at any point, except the factory of the manufacturer; these selections are made under oath, and the analyses of the samples are made by chemists who do not know whose or what fertilizer they are testing; every possible precaution is taken to make the test fair to both manufacturer and consumer. It is also the duty of these agents to report all violations of the law, whether by the sale of unlicensed fertilizers, or by their sale in sacks not stamped as required by law, and, in this manner, the Secretary of the Board is constantly kept posted in relation not only to the character of the fertilizers being sold in the State, but also as to the manner in which the sacks are branded. If any agent or manufacturer is found selling goods in sacks not branded in accordance with the above provision of the Act of June 28th, 1879, he is notified of his dereliction and the proper remedy is at once applied. In numerous cases of this kind, goods have been held in the hands of agents until the manufacturer has had time to prepare and send properly worded stencil plates with which the agent could correct errors made when the sacks were branded at the factory.

There is probably no State in the Union in which the interests of the consumer, at least so far as brands is concerned, is as closely guarded as in our own, and yet much of this labor is rendered practically useless because our farmers, in by far too many cases, fail to appreciate the great difference that is indicated by the brands, and continue to buy their fertilizers more with reference to their price per ton than their actual manurial value, as indicated by the analyses.

There are upon our market various brands of ground bone in which the manufacturers' guarantee, as recorded in this office and as branded on the bags, varies from 12 to 25 per cent. of phosphoric acid; and yet how many farmers, when called upon to make the selection of their fertilizer, are influenced by the price, as compared with that of some other brand, without regard to the quality as indicated on the bags. As between two articles of bone, one branded 12 per cent. of phosphoric acid and the other 24 per cent., too many farmers fail to understand that they can well afford to pay more than double the price of the low grade for the 24 per cent. article, because they will by so doing, get the value of two tons concentrated into one, and thus save freight and handling.

By far too many of the consumers of this class of goods look upon a ton of bone or of Acidulated South Carolina Rock as having a definite manurial value, and who fail to realize that one brand of South Carolina Rock may better be worth $18.00 per ton than another at but $14.00; that bone may vary in price from $20.00 to $35.00 per ton, and yet the latter article may be the most economical for their use.

Several cases have been brought to our attention in which purchasers have given $30.00 per ton for brands of fertilizers, and after the application of 200 to 250 pounds per acre, have obtained little or no perceptible benefit. When a copy of the analysis upon the bags has been sent to us, it was evident that the parties in question had paid at the rate of $30.00 per ton for plain Acidulated South Carolina Rock, under the impression that they were obtaining a complete fertilizer. In this case there was no fraud upon the part of the manufacturer; the bags were properly branded, and had the purchaser been even superficially posted as to the meaning of analyses, he would have known that the fertilizer was plain South Carolina Rock; the analysis told him so in as plain and distinct figures as could be used, but an unscrupulous agent had made use of his ignorance to impose on him.

In one case brought to our notice, a party had purchased a considerable amount of ground bone; a sample was sent to the department, by one of our special agents, for analysis, and it was clearly shown that the article was not pure bone; it was further shown by the analysis on the bags that the manufacturer only guaranteed 14 per cent. of phosphoric acid, when pure ground bone should contain from 22 to 25 per cent; in this case, as in many others, a knowledge upon the part of the purchaser would have saved a large amount of money, and considerable disappointment and loss in the crop. This knowledge could be obtained by a small amount of attention and study upon the part of any one familiar with figures and comparative values.

Knowing and realizing that it was largely to losses of this kind that so many farmers have arrived at the conclusion that "fertilizers do not pay," the Secretary of the Board decided that a lecture or address at our farmers' institutes, having for its object the imparting of knowledge upon this point, would be beneficial. A number of facsimile brands were prepared upon muslin, and used for the purpose of illustrating the addresses at not less than 100 farmers' institutes and agricultural meetings. After addresses of the kind, the writer has repeatedly been assured that if their substance could in some way be presented in printed form, so that farmers could study it at their leisure, the benefit would be greatly increased; it is in obedience to this request that these and the following pages have been prepared, and the Secretary will be willing, at any time, by correspondence or otherwise, to explain any point not here made sufficiently plain and distinct.

During our intercourse with farmers at institutes during the past five years, we have found so many cases of consumers who have, as they think, failed to make the use of fertilizers pay, that we have been interested in obtaining the real causes of the failure, and in nine-tenths of the cases a further investigation conclusively shows that the consumer had made his purchases without regard to analysis and was utterly unable to inform us whether he had used "South Carolina Rock," an "Alkaline Fertilizer" or a "Complete" one; and inasmuch as seventy-five per cent of the value of a fertilizer may depend upon which of the three classes it belongs to, it is evident that the whole of the failure might be attributed to an improper selection, or to the purchase of a low grade fertilizer at a high grade price.

For the purpose of comparison and distinction, we will divide fertilizers into classes as follows: Ground bone, South Carolina Rock, Alkaline Fertilizers, Dissolved Animal bone, and Complete Fertilizers; the analysis of each may be recognized by the following items which, according to law, must be stamped upon the bags in each case:

Ground bone. Phosphoric acid and ammonia.

South Carolina Rock. Phosphoric acid in three forms.

Alkaline fertilizers. Phosphoric acid in three forms and potash; if ground *animal* bone has been used, nitrogen or ammonia will also be branded.

Dissolved Animal Bone. Phosphoric acid in three forms, and nitrogen or ammonia.

Complete fertilizers. Phosphoric acid in three forms, or as "available," potash and nitrogen or ammonia.

As now guaranteed in our market, these classes of fertilizers may run anywhere between the points below:

Ground bone. From 12 to 25 per cent. phosphoric acid, and from 1 to 6 of nitrogen.

South Carolina Rock (acidulated.) From 7 to 30 per cent. of *available* phosphoric acid.

Alkaline fertilizers. From 4 to 6 per cent. of available phosphoric acid, and 2 to 5 of potash, soluble in water.

Dissolved animal bone. From 6 to 10 per cent. of available phosphoric acid, and 1 to 3 of ammonia.

Complete fertilizers. These vary so much in the relative proportions of phosphoric acid, potash and ammonia that it is impossible to give anything like a fair average; the amounts vary with the price of the fertilizer and the crop for which it is intended.

The general reader may learn much of the features which distinguish these different grades of fertilizers from the Fertilizer Analyses List, published by the Board; this list contains the result of the analyses of a large number of samples selected by special agents and tested by the chemists employed by the Board; they are distributed free to all who apply for them, and in the various forms, not less than 35,000 copies are annually sent out. They show the exact relation of the various kinds of fertilizers to each other, and the relation to the act of June 28th, 1879, to them, and will furnish a valuable addition to the information wanted in relation to the various brands of fertilizers sold in the State.

The record of brands licensed during the year ending August 1st, 1894, shows the following proportions of each class of fertilizers:—

1. Ground bone,	103	Brands.
2. South Carolina Rock,	91	"
3. Dissolved Animal Bone,	17	"
4. Alkaline Fertilizers,	42	"
5. Complete Fertilizers,	559	"

In Complete Fertilizers the law requires that the analysis on the bags shall state the following ingredients as they exist: Soluble and reverted phosphoric acid, insoluble phosphoric acid, potash "soluble in water;" and of "nitrogen or its equivalent in ammonia in an available form."

Potash may exist and be stated in a form other than that known as "potash soluble in water," in which its benefits to the crop may be materially curtailed. Ammonia may be derived from material in which it does not exist in "an available form," and hence be of little use as plant food. As the law is worded, potash not soluble in water, or ammonia not in an available form, is excluded from the analysis on the bags.

In Ground Bone, the phosphoric acid may be stated, according to custom, as "insoluble" not because it is in reality insoluble, but because this is a term understood by both manufacturer and consumer; but it should be understood that phosphoric acid, possibly, even in untreated South Carolina Rock, is more or less soluble and sooner or later becomes available as plant food. In fact, it may be assumed that the relative merits of different fertilizers in the same class and fertilizers in different classes, depends very largely upon the availability or solubility of their phosphoric acid.

GROUND BONE.

During the year ending August 1st, 1894, the farmers of the State used about 3,750 tons of ground bone as such and not mixed with other ingredients; for this they paid about $115,750; they probably received as great a return for the amount expended as from any other class of fertilizers sold in the State. The only drawback with which its general use meets, as compared with other fertilizers, is in the slowness of its action; its phosphoric acid has not been changed from the so-called, insoluble form to that of the "available or soluble and reverted combined." The phosphoric acid is in a form in which it eventually, all becomes available as plant food, and its use, as compared with other fertilizers, is merely a question of the length of time during which action may be expected.

In far too many cases, consumers of this class of fertilizers think that if they obtain "Animal Bone" they are safe and certain to obtain results at a profit over the cost. "Pure Ground Animal Bone" will vary greatly in value, even when no adulteration is present, and the analysis on the bags is the only safe guide for the purchaser; appearance is of but little value as a guide, but the analysis will, in all cases, show the consumer the character of the goods. The consumer should learn to purchase ground bone as the manufacturer does; the latter, in making his contract, does not usually stop with the use of the words, "Pure animal bone," but he goes one step further and demands that it shall be "the run of the pile;" and it is here that a chance for loss comes in for the consumer who buys his bone without any knowledge of analysis.

PURE

GROUND ANIMAL BONE.

200 LBS.

MANUFACTURED BY

THE BROWN FERTILIZER COMPANY,

HARRISBURG, PA.

Guaranteed Analysis.

Moisture,	6	to	8	per cent.
Phosphoric acid,	22	"	25	" "
Equal to				
Bone phosphate,	46	to	48	per cent.
Nitrogen,	3	"	4	" "
Equal to				
Ammonia,	3¼	to	4¼	per cent.

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To illustrate: Suppose that a train-load of unground bone be dumped down in the yards of one of the large fertilizer factories in Philadelphia, New York or Boston; if these bones are ground from the pile, just as they come, we have what the manufacturers understand by "the run of the pile," and we have some guarantee as to the amount of phosphoric acid and nitrogen the material will contain; but suppose that the manufacturer of umbrella handles selects from the pile all the hard shin and other solid bones suited to his purposes, and that he is followed by a manufacturer of bone ornaments who takes the shorter and smaller hard bones; that this manufacturer is followed by the manufacturer of course ground bone for furnishing bone black to sugar manufacturers, and that he is in turn followed by another, who takes the better class of bones suited to his purposes. What is left is perfectly "pure animal bone," but may be less economical at $20.00 per ton, that the "run of the pile" at $28.00, or the harder bones at $32.00 per ton.

The *average* of a large number of analyses of ground bone, extending over a series of several years, has been very nearly as follows:

Moisture,	5.75 per cent.
Insoluble phosphoric acid,	22.15 per cent.
Nitrogen,	3.65 per cent.
Commercial value, per ton,	$35.80
Selling price, per ton,	32.87

The analyses made by the Board show that, taking two extremes, there may be the following difference in the composition and value of samples as selected by the special agents of the Board:

1. Phosphoric acid, 17.05 per cent; Nitrogen, 3.58 per cent.
2. Phosphoric acid, 27.89 per cent; Nitrogen, 3.16 per cent.

According to the system of valuations adopted by the Board for the year ending August 1st, 1894, the first sample would have a "Comparative commercial value" of $28.35 per ton, and the second one a valuation of $42.76.

In the case of these two samples, our records show that, although it had a lower comparative commercial value, the purchaser of No. 1 gave $33.00 per ton, while the consumer who purchased No. 2, got it for $30.00 per ton. Is it, then, to be wondered at, that buying in this way, purchasers disagree in the results obtained, and that we occasionally meet with those who claim that as a profitable fertilizer, ground bone is a failure?

Comparing the purchasers of these two samples, it appears that No. 1 obtained a value of but $28.35 for $33.00 expended, while the purchaser of the second sample obtained a value of $42.76 for an outlay of but $30.00; is it unreasonable to suppose that the former may have failed to obtain any profit, while the latter realized a good percentage upon his outlay?

We find upon this year's records of the Board, brands of ground bone, (so called), upon the market, in which the manufacturer only guarantees, on the sacks and in the analysis recorded in the office of the Board, from 12 to 15 per cent. of phosphoric acid; other manufacturers guarantee their purchasers 22 to 25 per cent. and some as high as 26 per cent.

A careful examination of the contents of the sacks would probably fail to show this difference in their value, and yet the difference does exist; and consumers who buy carelessly or by guess, would be quite as likely to select the lower grade, especially as its price per ton is lower.

Phosphoric acid may be safely taken as the criterion of value in ground bone, for while nitrogen or ammonia may occupy a secondary position, it can mostly be furnished from some other source more economically; it is safe to assume that of two samples of bone, one showing 12 per cent. of phosphoric acid and the other 24, the latter is worth at least twice as much per ton as the former, and that, if freight is an object in enhancing cost, there is even a greater difference.

Inasmuch as plants can only obtain nourishment and food from the outside of particles of commercial fertilizers, and it is evident that this outside area is increased by finer mechanical division, it follows that the finer ground bone is, other things being equal, the more valuable it is per ton to the consumer.

Theoretically, a given weight of bone will have a certain manurial effect, and will contain a certain amount of phosphoric acid and nitrogen, whether it be whole, coarsely or finely ground; but it is evident that the more finely it is ground, the more rapidly it will give up its plant food to the crop. It therefore follows that fine bone is more valuable than coarse, and it is evident that the more finely it is ground, the greater its cost to the manufacturer.

In its system of valuations, the Board has, therefore, adopted a scale of prices for phosphoric acid and nitrogen in bone, dependent upon its mechanical condition as to fineness, and the following standard of division has been established in justice to all parties interested.

The bone is sifted into four grades, and assigned the following comparative conditions:

Fine. Through a sieve with meshes of 1-50th of an inch.

Fine-medium. Through a sieve with meshes of 1-25th of an inch.

Medium. Through a sieve with meshes of 1-12th of an inch.

Coarse. Not going through a sieve with meshes of 1-12th of an inch.

The valuations, as adapted to this scale of divisions, were as follows:

	Phosphoric acid.	Nitrogen.
Fine bone,	7 cts.	16½ cts.
Fine medium bone,	6 cts.	13 cts.
Medium bone,	5 cts.	10½ cts.
Coarse bone,	4 cts.	8½ cts.

The law requires that in his guaranteed analysis of ground bone, either in the office of the Board or on the sacks, the manufacturer shall state the phosphoric acid as such, and not state it in the form of "Bone phosphate;" there is no objection to such a statement of analysis as "Phosphoric acid, 22 to 25 per cent, *equivalent* to bone phosphate, 48 to 55 per cent," for the consumer or purchaser then understands that the two statements are counterparts and are equivalent to each other; but it would be manifestly unjust to permit one manufacturer to brand "bone phosphate" and compel another to brand "phosphoric acid," as the consumer will not understand that "bone phosphate" is (practically), represented by figures twice as great as those for phosphoric acid.

A majority of manufacturers in branding their ground bone state the ammonia in preference to giving the percentage of nitrogen; a few still retain the statement of nitrogen. To compare the two brands, the consumer has but to remember that fourteen pounds of nitrogen are equivalent to seventeen of ammonia, and reduced one to the other. Upon this basis, manufacturers usually prefer to state ammonia, probably because it is the larger figure, and it would perhaps be best that a universal rule should be made in favor of ammonia, for in that case, the consumer would have one source of danger removed.

ACIDULATED SOUTH CAROLINA ROCK.

South Carolina Rock, as it comes from the regions of the Ashley and Cooper rivers, or from the phosphate beds of Florida, has its phosphoric acid more tightly locked up than in ground bone, and if it becomes available at all, without chemical action, it is only after a long space of time and exceedingly minute mechanical division; its action, even under the most favorable circumstances, is too slow to warrant its economical use as a fertilizer.

Chemical action has thus far been found more economical than mechanical division, and all attempts to use it in its natural condition but finely ground, have resulted in a failure; there are, however, indications that in the course of time, deposits may be found which will be obtained at a cost which may warrant their application in an undissolved condition.

There are several plans for breaking up the chemical affinity which renders this material unfit for a fertilizer in its natural condition; the most common is that of the addition of sulphuric acid, diluted by water. This operation results in the formation of two other forms of phosphoric acid, known in chemistry as mono-calcic and di-calcic phosphate, the remaining phosphoric acid not changed by the chemical action taking the name of tri-calcic phosphates; these names are given from the fact that the first contains one proportion of lime, the second two and the third three. These forms are familiarly known to the consumer as "soluble," "reverted" and "insoluble" phosphoric acid; their relation to phosphoric acid and lime are shown as follows:—

Lime.
Tri-calcic or "insoluble" ......Lime.............. Phosphoric acid.
Lime.

Lime.
Di-calcic or "reverted" ....Lime................ Phosphoric acid.
Water.

Lime.
Mono-calcic or "soluble"......Water............... Phosphoric acid.
Water.

Tri-calcic or insoluble phosphate, is the natural condition in ground bone and untreated South Carolina Rock; it is insoluble in water but is sparingly soluble in certain saline solutions found in the soil; it usually contains from 42 to 46 per cent. of phosphoric acid.

i-calcic or "reverted phosphate," is formed by the action of the added sulphuric acid which deprives the "insoluble" of one proportion of its lime; it is also insoluble in water, but soluble in saline solutions of the soil to a much greater extent than the "insoluble;" when pure it contains about 52 per cent. of phosphoric acid.

ACIDULATED

SOUTH CAROLINA ROCK.

200 LBS.

MANUFACTURED BY

THE BROWN FERTILIZER COMPANY,

HARRISBURG, PA.

Guaranteed Analysis.

Moisture,	10 to 13 per cent.
Soluble phosphoric acid,	8 to 9 per cent.
Reverted phosphoric acid,	3 to 4 per cent.
Equal to	
Available phosphoric acid,	11 to 13 per cent.
Insoluble phosphoric acid,	1 to 2 per cent.

Mon-calcic or soluble phosphate, is soluble in water and is formed by the action of sulphuric acid which robs the insoluble of two parts of its lime; it does not exist in a natural condition, for when added to a soil containing any portion of lime (and all practically do), it takes up the lost one portion of lime and "goes back," or "reverts" to the calcic condition. Hence we may infer that it is not to the interest of the consumer to have the manufacturer carry the process so far as to make the mono-calcic or soluble condition, but inasmuch as the operation is more expensive to the manufacturer, our valuations allow him one-half cent per pound more for the soluble than for the reverted.

From what has already been stated, it is very evident that the value of Acidulated South Carolina Rock to the consumer depends greatly upon the amount of phosphoric acid which exists in the soluble or reverted condition, or as "available" phosphoric, which is the result of adding the percentages of the soluble and reverted together. It is also evident that, after the expense of grinding is deducted, the cost to the manufacturer is in proportion to the percentage which he makes "available."

This fact plainly indicates to the purchaser the great importance of thoroughly understanding an analysis, for without this knowledge, he may pay as much for South Carolina Rock with but 7 per cent. available, as for that which is guaranteed to contain 15 per cent. Depending upon this want of knowledge on the part of the consumer, some manufacturers place several grades of South Carolina Rock upon the market, each being branded with a different percentage of available phosphoric acid; these grades vary, as is shown by the record book of the Board, from 10 to 12 per cent. to as high as even 15 to 17 per cent., the result being that, to the uninitiated, the higher grades are made to sell the lower ones, the consumer not properly understanding the difference as is clearly indicated by the analysis on each sack.

Many cases have also been brought to the knowledge of the writer in which purchasers, after having obtained a fair knowledge of the meaning and value of the analysis, have failed to appreciate the difference in value to them of goods running 10 per cent. and others running to 15 per cent.; the difference in price as made by manufacturers *and especially by agents*, is always in favor, to them, of profit on the lower grades—that is to say, in the lower grades, the consumer pays more *per pound* for his available phosphoric acid than he does in the higher ones.

South Carolina Rock affords to the customer the easiest of all analyses to understand, because he has but the one ingredient to watch, (phosphoric acid), and that only in its three forms, or, if the manufacturer gives the percentage of "available," but one form, for that of the insoluble is not worthy of his attention, except as it may serve as a reverse measure of the available. In all other fertilizers he has at least two and mostly three, ingredients to look after.

In this connection the consumer should always remember that when he finds the bags branded with soluble phosphoric acid, reverted phosphoric acid and insoluble phosphoric acid, it matters not what the name of the fertilizer may be, what the agent may tell him, or what the price asked for the fertilizer is, he is buying Acidulated South Carolina Rock, and its value is solely determined by the percentage of available phosphoric acid which is guaranteed.

In this connection the purchaser should not be misled by the duplication of terms used by some manufacturers as a means of imposition upon consumers who are not posted in analyses; thus, for instance, we may give the following as taken from sacks containing goods offered for sale in our State:

Soluble phosphoric acid,	8 to 10
Reverted phosphoric acid,	3 to 4
Available phosphoric acid,	11 to 14
Bone phosphate,	25 to 30
Insoluble phosphoric acid,	1 to 2
Total phosphoric acid,	12 to 16
Total bone phosphate,	30 to 35

The analysis, robbed of all duplication, means the following:

Soluble phosphoric acid,	8 to 10
Reverted phosphoric acid,	3 to 4
Insoluble phosphoric acid,	1 to 2

The term "available" means simply the adding together of the "soluble" and "reverted;" and the bone phosphate means practically, the multiplication of the phosphoric acid by two, because one part of available is practically equal to two of bone phosphate.

A want of knowledge of the nature of the analysis also renders purchasers liable to loss and often disappointment, from the fact that in some cases, the manufacturers brand their sacks with the name of the fertilizer resembling that of a Complete Fertilizer, but they at the same time use the usual analysis for South Carolina Rock, and by which it may readily be known. Cases have been brought to our knowledge in which the consumer has purchased "soluble bone phosphate" and "dissolved bone phosphate" under the impression that he was buying a complete fertilizer; the only protection against this error on the part of the consumer is the study of the brand and its meaning, and when he has accomplished this, he is in no danger of being deceived in this way. This practice is usually found to be the result of deception on the part of the agent, but he is in this assisted by the manufacturer, who gives to South Carolina Rock a brand which misleads the uninitiated consumer.

Our attention has been directed to one case in which the manufacturer has added to his South Carolina Rock analysis the following misleading line:

"Ammonia, ... 0.00 per cent,"

the apparent intent being to catch the eye of the unguarded purchaser with the word "ammonia," and thus lead him to suppose that he was obtaining something more than plain South Carolina Rock.

All South Carolina Rock, under the reagents used by the chemists, shows a trace of nitrogen; this may come from undecomposed matter in the Rock itself, or it may exist as an impurity in the sulphuric acid used; some manufacturers add to their analysis, and sometimes also a small portion of ammonia to the fertilizer, and in their analysis guarantee:

"Ammonia, ... 0.25 to 0.50 per cent."

Originally, this addition had for its object the insertion of the analysis of the fertilizer in our list of "Complete Fertilizers," and the addition of $4.00 per ton for bagging, mixing, etc., but this object not having been accomplished, the addition is retained not only for the purpose of obtaining the added valuation for the nitrogen, but also to add to the analysis and to the price asked for the fertilizer.

Purchasers of South Carolina Rock should protect themselves by studying up the analysis, and buy it only for the "Available" phosphoric acid guaranteed to be in it; they should not be misled by guarantees of slight amounts of ammonia, or by names which have a tendency to mislead; practically, all they get is the available phosphoric acid, and they should buy for it alone.

In connection with the purchase of South Carolina Rock, it may be noted that the tendency of farmers to buy it according to the price asked per ton, and often regardless of its quality, has compelled the withdrawal of the higher grades from the market. In former years, brands were placed upon the market guaranteed to contain over 30 per cent. of available phosphoric acid, but through comparison by price alone, they have been forced from the retail market, and are now purchased by other manufacturers, either as a basis of phosphoric acid in complete fertilizers, or increased by, cheap "fillers" from one ton to three, and sold at a comparatively higher price per ton. Purchasers have refused to pay manufacturers at the rate of 75 cents *per cent. or unit*, for high grade goods, and have purchased lower grades at $1.00 *per cent. or unit.*

The better way is to value the available phosphoric at its cost *per pound*; this can be done by multiplying the percentage guaranteed by twenty, to get the number of pounds guaranteed per ton, and then divide the price per ton by the result; this will give the cost per pound of the available phosphoric acid.

As an illustration, suppose that a 15 per cent. rock can be purchased for $15.00 per ton; twenty times fifteen gives us 300, or the number of pounds of available phosphoric acid in one ton; divide the price per ton ($15.00), by this and we obtain its cost per pound, or 5 cents. In a ten per cent. article, at the same price per ton, the available phosphoric acid would cost the purchaser at the rate of 7½ cents per pound.

Any one who wishes to estimate the loss to farmers by the careless purchase of South Carolina Rock need only look over the Fertilizer Analysis Lists issued by the Board; there he will see South Carolina Rock selling at all prices, from $14.50 up to even $30.00 per ton; and in some cases, the higher priced articles having the lower "comparative commercial value."

Taking the *average analyses* of a large number of samples of South Carolina Rock, made from samples sent in during several years past by the special agents of the Board, we find the following to be the result:

Moisture,	9.98 per cent.
Soluble phosphoric acid,	10.20 per cent.
Reverted phosphoric acid,	3.40 per cent.
Equal to available phosphoric acid,	13.60 per cent.
Comparative commercial value,	$22.25
Average selling price,	$18.40

ALKALINE FERTILIZERS.

The appearance of this comparatively new class of fertilizers upon our markets within the past five years, and the rapid increase in their consumption, is probably due to a combination of two causes, both working in the same direction. Farmers who purchase by price per ton, alone, demanded a lower grade of fertilizer, but would not purchase South Carolina Rock at complete fertilizer prices, and the fact that in localities where large amounts of rich barn-yard manure were applied, there was already sufficient nitrogen in the soil for the wants of the crop, led to the introduction of a fertilizer in which the most expensive ingredient (nitrogen or ammonia), was left out.

In the earlier history of the class, the trouble was that the reduction in cost to the manufacturer was not accompanied by a corresponding reduction in the price, and as a natural consequence, such fertilizers did not yield the profitable returns to the consumer that they should have done. In a majority of cases, they were composed of Acidulated South Carolina Rock, mixed with a low grade of potash; as for instance, Kainit; with the South Carolina Rock at $15.00 per ton, and the Kainit at $14.00, any admixture of the two which could be sold at $25.00 to $30.00 per ton was profitable to the manufacturer, and afforded liberal commissions to agents. Within the past three years, however, the prices of this class of goods has been reduced to figures more nearly corresponding to the market value of the ingredients, and we now find them selling as low as $17.00; and at this price, giving excellent results for the money expended. As before stated, their place appears to be upon land already containing, from other sources, sufficient nitrogen for the wants of the crop.

In the guaranteed analysis of this class of fertilizers, we usually have, if made from South Carolina Rock and kainit or other potash salts, a statement of phosphoric acid in its three forms (or as available only), and potash; the value of the fertilizer depending, as in other cases, upon the relative amounts of each ingredient guaranteed.

Taking three years in succession, we find the *average* official analysis of this class of goods to have been as follows:

Moisture,	12.12 per cent.
Soluble phosphoric acid,	8.27 per cent.
Reverted phosphoric acid,	3.40 per cent.
Equal to	
Available phosphoric acid,	11.67 per cent.
Insoluble phosphoric acid,	1.12 per cent.
Potash,	3.28 per cent.
Comparative commercial value,	$22.84 per ton.
Average selling price,	$19.67 per ton.

In the purchase of this class of fertilizers, it is well to remember that no matter what the name and price, if the guaranteed analysis shows nothing but phosphoric acid (in three forms or as available), and potash, you are getting South Carolina Rock and potash. If the manufacturer has used ground animal bone in the composition of the fertilizer, he will, in his guaranteed analysis, claim ammonia and will use the words, "animal" or "raw bone" in the name of the fertilizer. In the absence of the use of either of these titles and no ammonia claimed, the purchaser should always assume that he is getting South Carolina Rock and some salts of potash.

ALKALINE PHOSPHATE,

200 lbs.

Manufactured by

THE BROWN FERTILIZER COMPANY,

Harrisburg, Pa.

Guaranteed Analysis.

Moisture,	11.50 per cent.
Soluble phosphoric acid,	6 to 7 per cent.
Reverted phosphoric acid,	3 to 4 per cent.
Equal to	
Available phosphoric acid,	9 to 11 per cent.
Potash,	4 to 5 per cent.
Equal to sulphate of potash,	8 to 10 per cent.

The law distinctly requires a statement in the recorded and guaranteed analysis of "potash soluble in water." In Alkaline fertilizers, more perhaps than in any other class, we find that there is a tendency on the part of manufacturers to state the potash as "sulphate of potash," instead of simply "potash," which is understood by the trade and by common consent to mean "potash soluble in water."

When we remember that 100 pounds of sulphate of potash are only equivalent to 54. of "potash," the intent of this variation of analysis is evidently to mislead the consumer into the belief that he is obtaining a larger percentage of potash than the guarantee really calls for. Some manufacturers use the following form, which is neither objectionable nor illegal:

Potash, ... 2 to 3 per cent.
Equivalent to (or equal to) sulphate of potash, ... 4 to 6 per cent.

This caution applies with epual force to all fertilizers which contain potash, and the tendency to use the statement of sulphate of potash, to the exclusion of potash only, is to be noted in complete fertilizers; in neither case is it admissible, and if found and reported by the special agents of the Board, the goods must be held unsold until the law has been strictly complied with.

DISSOLVED ANIMAL BONE.

This brand, as understood by the trade, is used to distinguish ground animal bone which has been treated with sulphuric acid for the purpose of making it more readily available as plant food. The original ton of bone contains a definite amount of manurial action or value, and the fact that it has been treated with sulphuric acid does not add anything of action or actual value to the ton; the acid, as it has been shown in the case of South Carolina Rock, merely makes the phosphoric acid available; the same changes as were noted in the treatment of South Carolina Rock take place and might be described by exactly the same formula.

The action having been quickened by the use of the sulphuric acid, it naturally follows that the effect is exhausted that much sooner, but the fact is, that the total effect has been somewhat decreased, because the water and acid added is not entirely dried out, and hence, adds to the weight, and to that extent at least, decreases the total amount of manurial action. As a proof of this, it may be noted that for the years 1892-3, the average amount of moisture in the samples of dissolved animal bone tested by the Board, was found to be 9.34 per cent., while the average moisture in the samples of bone selected during the same year, was but 5.89 der cent.; a difference of 69 pounds of moisture per ton of fertilizer.

In its guaranteed and recorded analysis, dissolved animal bone differs from South Carolina Rock in the fact that it contains ammonia or nitrogen in considerable amounts, and South Carolina Rock does not; it differs also from the class of Alkaline fertilizers in that it contains nitrogen and no potash at all; it differs from Complete fertilizers in that it contains no potash, and the addition of some salt of potash would at once convert it into an ammoniated animal bone phosphate" and it would be sold and known to the trade as such.

PURE

DISSOLVED ANIMAL BONE,

200 lbs.

Manufactured by

THE BROWN FERTILIZER COMPANY.

Harrisburg, Pa.

Guaranteed Analysis.

Moisture,	8 to 9 per cent.
Soluble phosphoric acid,	7 to 8 per cent.
Reverted phosphoric acid,	3 to 4 per cent.
Equal to	
Available phosphoric acid,	10 to 12 per cent.
Nitrogen,	2 to 3 per cent.
Equal to	
Ammonia,	3 to 4 per cent.

The average analysis of this class of goods, taken from the official analyses of the Board for a term of years, has been as follows:

Moisture,	9.39 per cent.
Soluble phosphoric acid,	7.15 per cent.
Reverted phosphoric acid,	3.87 per cent.
Equal to	
Available phosphoric acid,	11.12 per cent.
Nitrogen,	2.80 per cent.
Equal to ammonia,	3.40 per cent.
Comparative commercial value,	$30.56 per ton.
Selling price per ton,	$29.80 per ton.

The use of Dissolved Animal Bone, in comparison with the same article simply ground, is dependent upon the cost of acidulating; the gain to the consumer is simply in the increased action; by the application of ground bone, one year in advance, it is possible that similar results would have been obtained; it is only a question whether the increased benefit is counterbalanced by the increased cost.

COMPLETE FERTILIZERS.

Under this head we group all fertilizers not included in the former classes; their variation is due to a difference in the proportions of available phosphoric acid, insoluble phosphoric acid, potash and nitrogen or ammonia, which they may contain; and their value and price per ton is somewhat controlled by the sources from which these ingredients are derived.

This variation, under the schedule of valuations for the year ending August 1st, 1894, was as follows:

Nitrogen in mixed fertilizers,	19 cents per pound.
Soluble phosphoric acid,	8 cents per pound.
Reverted phosphoric acid,	7½ cents per pound.
Insoluble phosphoric acid from bone,	3 cents per pound.
Insoluble phosphoric acid from S. C. Rock,	2 cents per pound.
Potash from muriate of kainit,	4½ cents per pound.
Potash from sulphate,	6 cents per pound.

In some brands of complete fertilizers, nitrogen is only added in small amounts, and in some, might very properly be reported as "a trace," and if the price is in proportion to the amount of nitrogen used, it is possible that, at least in many instances, the purchaser is not a loser; the percentage of potash also varies greatly, running from a minimum of less than 1 per cent. up to 8 per cent in a potato fertilizer.

Former references to the branding of "bone phosphate," and "sulphate of potash" apply with equal force to the analysis of complete fertilizers, and the purchaser should in all cases guard against being misled by their improper use. The use of the terms, "nitrogen" and "ammonia" should also be watched closely, so that no misunderstanding or disappointment may arise.

XXV

COMPLETE FERTILIZER,

200 lbs.

Manufactured by

THE BROWN FERTILIZER COMPANY,

Harrisburg, Pa.

Guaranteed Analysis.

Moisture,	10 to 11 per cent.
Soluble phosphoric acid,	5 to 6 per cent.
Reverted phosphoric acid,	3 to 4 per cent.
Equal to	
Available phosphoric acid,	8 to 10 per cent.
Insoluble phosphoric acid,	1 to 2 per cent.
Potash,	2 to 3 per cent.
Ammonia,	2 to 3 per cent.

In selecting fertilizers of this general brand, the purchaser should guard against the possibility of being misled and disappointed by the "Comparative commercial value" it should be remembered that nitrogen is by far the most expensive ingredient used in fertilizers, and a high "Commercial value" may be reached by the use of large proportions of nitrogenous material; if this ingredient is needed by the soil or crop to which the fertilizer is applied, its purchase is all right and may prove profitable, but if the fertilizer is applied in connection with barn-yard manure, or to a soil already rich in nitrogen, disappointment will ensue, because the purchaser has paid a high price for an ingredient which he did not need, and by experiment, would have found that an equal amount of an "Alkaline fertilizer" costing probably not more than one-half or two-thirds as much per ton, would have given him equal or better results.

Much of the disappointment which follows the use of "Complete fertilizers" may be justly attributed to an improper selection; the fertilizer contains all that the manufacturers guarantee they shall, but this material, in many cases, being of an expensive character and not needed by the soil or crop, is practically lost to both; as previously stated, much loss annually ensues from this cause, and much that we have urged in relation to South Carolina Rock applies with equal force to complete fertilizers, with however, this exception, that the choice of a brand of South Carolina Rock is comparatively a simple matter from the fact that the purchaser has but one element (available Phosphoric Acid), to watch, while in a complete fertilizer he must not only see that he gets a proper amount of each, but also that he is not purchasing expensive nitrogen when his soil already contains a sufficient supply for the crop, or that he is applying an ample amount in the form of yard-manure.

There is probably no greater source of loss in the application of commercial fertilizers than that sustained by the purchase of a fertilizer containing a large percentage of nitrogen or ammonia when that element is not needed. For comparison, suppose that the fertilizer is to be applied in connection with an application of barnyard manure, and we have to make a selection between two fertilizers, one of which contains four per cent. of nitrogen and the other but one per cent; the additional three per cent. of nitrogen is equivalent to 60 pounds per ton, which, at the rates adopted for 1893-4, would add $11.40 to the cost of the fertilizer; if this extra amount of nitrogen is not necessary, it is practically $11.40 thrown away with each ton purchased.

In comparing the "Comparative commercial value" of complete fertilizers, as shown by our Fertilizer Analyses lists, purchasers should be careful to notice the character of the element from which the higher valuations obtain the increase; if the increased valuation is due to the presence of a large amount of nitrogen which is not needed, then the danger of loss comes into the calculation; if, on the other hand, this increase is due to the presence of an increased amount of potash and the fertilizer is for potatoes, notwithstanding its comparatively high price, it may prove profitable.

At the present time there is in the trade a strong disposition to mislead the consumer by the skillful use of words in the names of the fertilizer; the purchaser who has not studied the matter of brands may not detect the difference between an "ammoniated bone phosphate" and an "ammoniated raw bone phosphate," and yet to those who want strictly bone fertilizers, there is a difference; an "ammoniated raw bone phosphate," made by a manufacturer who is careful of the reputation of his goods, will obtain its phosphoric acid and at least a portion of its nitrogen, from raw animal bone; the brand will not admit of the use of South Carolina Rock in the make-up of the fertilizer; the purchaser very often does not distinguish between the two brands.

Recently a western firm placed an article of "dissolved bone and potash" on the market; it could be guaranteed to contain nothing but pure, dissolved animal bone and high grade potash. The price at which it could be offered was considerably above that of brands bearing the same or similar names, and the manufacturers were at a loss to understand why their brand could not be sold to farmers and consumers. The insertion of the word "animal" before the word "bone" would, to the farmer who has made a study of brands, have increased its value of the brand to him, but as the goods were branded, they were in competition with brands containing South Carolina Rock, (often of a low grade), and potash; the insertion of the word "animal" indicated the derivation of the phosphoric acid and, to those who favor animal bone fertilizers, at once increased the valuation of the brand accordingly. The use of pure animal bone had increased the cost to the manufacturer to a point at which it could not be offered in competition (in price), with brands which obtained their phosphoric acid from rock, and hence the trouble in placing the goods on the market.

The law plainly requires that each manufacturer, in the analysis stamped on the bags and recorded in the office of the State Board of Agriculture, shall state "the percentage therein contained" of each element; no provision is made in the law for a margin, and as a matter of course, when such a margin is stated, the lowest figure only is the guarantee. Many of the leading manufacturers of this and other States, in recording their guaranteed analysis, make use of but one figure, and take that as their minimum guarantee; if their customers obtain more, it is their gain; but the manufacturer only guarantees the minimum. Thus, if the guarantee is "10 to 15 per cent," it means but 10 per cent; the purchaser should not be misled and suppose that he is likely to get fifteen per cent.; if he does, it is usually by a mistake of the manufacturer and not by design, for the minimum only is guaranteed.

To illustrate this, let us take the following analysis which was offered for record at the office of the Board:

Moisture,	10 to 15 per cent.
Available phosphoric acid,	6 to 10 per cent.
Insoluble phosphoric acid,	2 to 4 per cent.
Potash,	3 to 9 per cent.
Ammonia,	2 to 6½ per cent.

In this, as in all similar cases, the purchaser should remember that the minimum figure is the real guarantee, and that the higher figure is not to enter into his valuation of the fertilizer at all. It may be claimed that we have selected an extreme case, and it is true that we have done so, and for the purpose only of illustration, but all that is true of this extreme case applies with proportionate force to other cases in which the margin is less.

Supposing the fertilizer to have been compounded to make the manufacturer and agent perfectly safe, under the first line or figures of the guarantee, the fertilizer will have a "Comparative commercial value" of $21.50 per ton; but if it has been compounded to make a guarantee of the last line of figures perfectly safe, its commercial valuation will be $52.60 per ton, or a variation of $31.10 per ton.

It would not be at all surprising if one farmer should purchase this fertilizer at $21.50 and another should pay $52.60 for it, that either the former would be enthusiastic over the results, or the latter would consider commercial fertilizers a failure and a fraud; and yet it is to such transactions as this that many of the failures to make fertilizers profitable, may be traced.

In far too many cases, the purchaser does not realize the difference in value which exists between one brand of South Carolina Rock, guaranteed to contain 10 per cent. available, and another guaranteed to 15 per cent; the former will often sell for $13.00 per ton, and the latter for $15.00; and too many purchasers buy the former under the impression that they are saving by so doing; the former gives the purchaser 200 pounds of available phosphoric acid for $13.00, or at the rate of 6½ cents per pound, while the latter gives him 300 pounds for $15.00, or at the rate of 5 cents per pound, thus giving him a considerable saving in the price of his phosphoric acid, as well as an additional saving in freight. This argument, though more evident with South Carolina Rock, will apply with similar force to the purchase of all kinds and brands of fertilizers.

Many manufacturers in their analysis state the percentage of moisture; this is not required by the law, but perhaps it would be an additional safe guard to the purchaser if it was required. That it is important is illustrated by the following experiment made by the Board:

A sample of fertilizer selected in York county was taken, because it gave an extremely high percentage of moisture; the analysis was carefully made by Dr. Frear, and the remainder of the sample then dried to a minimum amount of moisture; in the first analysis, the percentage of moisture was 18.76, and in the dried sample, it was but 8.75, or, practically, 10 per cent. of water, or 200 pounds per ton, had been dried out. The two analyses were as follows:

Moisture,	18.76	8.75
Soluble phosphoric acid,	2.06	2.31
Reverted phosphoric acid,	3.03	3.23
Insoluble phosphoric acid,	1.93	2.17
Potash,	4.15	4.66
Nitrogen,	3.72	4.18

This fertilizer, if valued by the first analysis, was worth (by valuations of 1893-4) $29.42 per ton; if valued by the second analysis, it was worth $32.52 per ton, or a gain of $3.10 per ton by the removal of 200 pounds of water.

In this connection, it, however, should be remembered that the benefit to the consumer by this drying out of moisture depends upon where and how it took place; if the 200 pounds were taken out of each ton at the factory before the fertilizer was bagged, the manufacturers would be compelled to add just that much more fertilizer to make the weight up to 2,000 pounds; but if the excess of moisture was lost after the fertilizer had been bagged, the purchaser did not obtain the same amount of gain by the transaction. It is true that practically, in either case, he sustained no loss, but in the latter case, it is very evident that he was the gainer.

In justice to the manufacturer, it should be stated that if a fertilizer has been kept at a railroad station or warehouse and so protected that none of its phosphoric acid, potash or nitrogen have been lost, the mere drying out of the moisture is no loss to the purchaser, for he still obtains his guaranteed amount of the different elements named in the analysis; but if, on the other hand, the drying out takes place before bagging, it is that much gain to the consumer. It is therefore advisable, other circumstances being equal, to purchase the fertilizers with the least moisture.

At the risk of repeating points already covered by the preceding pages, we give the following summary of items to be looked after in the purchase of fertilizers.

1. In ground raw bone, examine the percentage of phosphoric acid guaranteed; if this is below 20 per cent. it is but reasonable to expect that either the better bones have been taken out, or some filler has been added. The fact that the percentage runs below 20 should not, however, prevent the purchase, if there is a proportionate decrease in the price asked.

2. In the purchase of bone, multiply the lowest guarantee of ammonia by two, and this by 18, and deduct the sum from the price of the fertilizer; the remainder will show you the valuation of the phosphoric acid; and this in turn, when divided by the number of pounds of phosphoric acid guaranteed per ton, will show the cost per pound of this ingredient.

3. In buying Dissolved South Carolina Rock, pay special attention to the soluble and reverted phosphoric acid guaranteed, or to the "available phosphoric acid," remembering that the percentage of the latter is obtained by adding the soluble to the reverted.

4. Multiply the percentage of available by twenty to get the number of pounds in each ton, and divide the price per ton by these figures, and the result will be the cost per pound of the available phosphoric acid. In comparing two brands of South Carolina Rock, use these results for comparison, and not the price per ton.

5. In purchasing South Carolina Rock, the buyer gets nothing of value but the phosphoric acid, and practically, nothing but the available phosphoric acid, because the insoluble has such a low value, and the items of freight and handling are important factors in determining cost; in many cases the single item of freight will throw the saving in cost in favor of the high grade goods.

6. In the purchase of Alkaline fertilizers, remember that the ingredients sought after are phosphoric acid and potash, and that, therefore, following the reasoning used for South Carolina Rock, the chances of economy are in favor of those brands which give the highest percentages of these ingredients.

7. Before purchasing a complete fertilizer, decide whether you want phosphoric acid, potash or nitrogen, or a mixture of two or all of them, and having decided this, buy such brands as give these articles at the lowest cost per pound.

8. In comparing fertilizers in actual field practice, do not compare them pound for pound, but in accordance with their cost, using amounts of equal cost side by side. It is manifestly unfair to apply 250 pounds of South Carolina Rock, costing but $3.25, alongside 250 pounds of a complete fertilizer, costing $7.50, and expect equal results; the value of the two applications should be the same.

9. Remember that the use of fertilizers is merely one of the expenditures of business capital, and that it is possible that a failure to make an economical selection may destroy all the margin for profit in the production of farm crops by their use.

10. Bear in mind the fact that agents are likely to keep in stock such fertilizers as will give them the greatest profit, and that it is their business to make money by their sales. They, if you demand it, will furnish what you want, but so long as you, by failing to understand your business, rather offer them a premium to give you a low-priced fertilizer at an increased price, they will do so.

ADDRESSES AND ESSAYS FROM MEETINGS AND INSTITUTES.

TOWNSHIP HIGH SCHOOLS.

BY DR. N. C. SCHAEFFER, *Superintendent of Public Instruction, Harrisburg, Pa.*

On the farm there is nothing more precious than the farmers' sons and daughters. Many of these leave the farm to engage in other pursuits. Some must remain to take charge of the old homestead of our rural districts so that they are not entirely depopulated. Our public schools have been managed largely in the interest of those who expect to leave the farm. What have they done to promote the interest of those who are to remain on the farm?

In teaching the boys and girls to read, write and cipher, much has been accomplished for the rising generation. He who has *learned to read* may henceforth *read to learn.* For two cents, he can buy a newspaper that will give information of what is transpiring the world over. For a fraction of his day's wages, he can buy the Book of books, which will be a guide to him in his religious faith and practice, and in his dealings with his fellow men. In manifold ways, the power to read, write and cipher is of invaluable service to every man and woman in civilized society.

The question, however, is: Have the public schools done the farmers' sons and daughters all that can be done to fit them for their future duties on the farm? The question must be answered in the negative. To read a treatise on agriculture intelligently, implies some knowledge of the elements of botany, chemistry, geology, physics, zoology including entomology. The instruction in our public schools as hitherto given has not opened the eyes of the pupils to the.wonders that transpire on the farm, nor to many of the facts which lie at the basis of successful husbandry. We have taught many things about the sun, the moon, and the stars which are million of miles away from us, but very little about the soil on which we tread and from which we draw our sustenance. The preparation of the soil for the seed; its improvement by tillage and by the rotation of crops; the needs of the farm; the diseases of crops; the insects and the birds are the friends or foes of the farmer; the principles which underlie the feedeing, care and management of horses, cattle, sheep and swine; the cultivation of forest trees for shade, ornament and protection, and the still more important art of growing berries and fruit trees—these and kindred subjects of vital importance to the human race, have received no attention in our elementary schools.

The reason and the remedy for this state of things is not difficult to find. The body of knowledge which is indispensable for this kind of instruction, has not been accessible to the average teacher, or if accessible, he did not have enough scientific training to master this knowledge for the purposes of instruction. The remedy is to be found in a system of township high schools. If a populous township, or several sparsely settled townships were to establish at some central point a high school for the instruction of all the advanced pupils in its schools, these could drive from their homes to the central high school, leave their horses in sheds erected for the purpose, and return to their homes in a short time at the close of school. For such central high schools, teachers could be secured who are competent to give instruction in the branches above named, and who could teach the rudiments of agricultural science as far as the community would want such instruction.

A noted educator on coming to America compared our system of public instruction to a two-story building, well furnished on the first floor and well equipped on the second floor, but without a suitable stairway to ascend from the first to the second story. To build this stairway, our legislature should foster a system of high schools by an annual appropriation, to be distributed in sums proportionate to the number of years of study which each high school maintains beyond the common branches. A standard of scholarship could then be fixed for the teachers in these high schools, and the dream of the granger would soon be realized in the shape of practical instruction in agriculture wherever a community felt the need of this instruction. An appropriation for this purpose would chiefly benefit the rural districts, for the bulk of the money would not go to the cities, but to the townships which far outnumber the cities, and boroughs. It would prevent the larger portion of the money thus appropriated from going to the cities, as is now the case, with the annual appropriation of five and a half millions, which is distributed upon the basis of the number of taxables returned at the last triennial assessment. Moreover, it would soon cause a change of public sentiment with reference to farming in country districts. Instead of creating in all the parents and pupils a desire to leave the farm for the sake of securing better educational facilities, it would make education beyond the common branches possible in every rural community and inspire every child with a due sense of the intellectual dignity of the vocation of farming.

The day may be near at hand when the microscope will be as indispensable to the farmer as the plow; when we will harness the lightning to his machinery as he now does the horse. When the day comes, the farmer will not be satisfied with mere instruction in the three RR's, but will demand that his children be taught the use of the microscope and the applications of electricity. Stranger things have happened in the industries of modern life. It is not chimerical to hope that agriculture, which in every land has been at the root of advanced civilization, will, in the progress of the next century, be the crowning glory of the most progressive people on the face of the earth. To this end let high schools be established in every township of Pennsylvania.

SOME ROAD EXPERIMENTS.

By S. R. DOWNING, *Member-at-large, Goshenville, Pa.*

Our township, of East Goshen, Chester county, borrowed $30,000.00 for road building, payable $1,000.00 annually, with interest at 5 per cent.

In the past 30 years we had expended on dirt roads $40,000.00, leaving at the end of the 30 years but a road scraper, two stone arches and 16 feet of road pipe as assets of this large sum. The Bardsley failure seemed no more complete to us than this. To stop at once this deplorable waste, and turn our taxes into an investment, we decided to borrow money and thus to build the best modern roads possible, aided by the necessary ample capital and machinery.

True, we had the usual dread of mortgaging our townships, but as we figured and argued, the fact came to light that thirty years ago, our township was liable for the $40,000.00 collected thereafter. We found by our township book that within the past ten years, our dirt road tax had increased one mill. That in ratio with this increase in mileage, our township under a dirt road tax would have been last year liable for the principal sum of $83,700.00 payable during the future thirty years. This, without any issue of bonds, we realized that after all, our properties were bound in law, and thus virtually mortgaged for all future maintenance; that there was but the difference, then, between tweedle-dum and tweedle-dee, between liability to a bank and liability to the township. That tax was a lien and therefore, virtually a mortgage. Thus we discovered that we could build six or eight miles of modern road, not piked, and keep up repairs nearly, if not fully within what we would waste on dirt roads. That at the end of thirty years, we could have assets or an investment to the extent of 6 or 8 miles of roads without or with little increased expenditure over our usual dirt road maintenance. As to this, I will submit a result further on.

"Why not build for cash and save interest?" queried the opposition. We urged as an answer that this $30,000.00 that we loan can go back to our people, pro rata, with taxes paid by them and for services in hauling and crushing. Thus, by owning our machinery and doing our own work, we could save the difference of 15 cents per perch between cost of a hired crusher and the crusher owned by the township. We could save to ourselves the $30,000.00 loaned, by hauling it out. Further than this, we could manipulate our crusher to suit us, turning out the finest material required to build the best roads, our experience in hiring a crusher having shown that the owner, in order to make large money, would open the jaws, turning out unsuitable, coarse, piking material. Thus our rubble would cost us 10 cents a perch for crushing by our own machinery; 25 cents as we had realized by a hired machine used by us but a little while, and at former times we could only get a coarse rubble out of our hard rock by hammer at 75 cents to a dollar a perch. On this basis then, we concluded that the profit on our capital loaned would far outstrip the amount of interest. That in fact, capital was needed in order, first, to save money, and second, to build the best roads.

Then, as against the cash plan, we produced this estimate:

Cash per mile, ...	$4,000.00
Cash for engine, crusher, roller, sieve	3,000.00
Cash for maintenance of dirt roads, ...	1,400.00
Total cash cost, first year, ...	$8,400.00

Our real and personal valuation producing $650.00 per mill, it follows that our tax for the first year would be at the rate of 13 mills, or for the second year, less cost of machinery, 8 mills; so much for the cash plan.

On the other hand, under the loan plan, and as an actual result after expending $28,000.00, paying an instalment of $1,000.00, interest, $800.00, and maintenance, $200.00, in all $2,000.00, our millage did not reach 3¼ mills for our 6 miles of hard roads and all maintenance, or less than a fourth of a mill over our old dirt road tax. True, using our capital only as we needed it, we lacked paying $700.00 of our full interest. Had we paid this, our rate would have been 4¼ mills under the loan plan, as against 13 mills under the cash plan. I may say, however, that we actually levied 4 mills, the excess over our instalment of principal, interest and maintenance being used for the removal of snow and the building of a new piece of dirt road.

How was all this done for 4 mills? In a word, simply by macadamizing roads that heretofore absorbed the bulk of our tax.

Not only this, but we were getting $3.50 per day for hauling stone to the new roads. Consequently we had no time to work up our taxes on the little used dirt roads. Our supervisors sent a good crew and team with the scraper, and with a little unusual skill, our byroads were redeemed from the gutters and edges at less than half the cost of former wears, and these roads were equally as good as in former years, a precedent that will save us plenty of money in the future.

Then again, we substituted, using our loan money, iron pipe, brick and stone water-ways for our perishable plank bridges. This was and long will be a great saving. Now if we had built with cash, a half mile of road, as some of our townships are doing, there would have been left 5½ miles of our worst road to maintain, and thus we could not have saved as we did, some $1,700.00, on roads that no scraper could drain or replace.

If you will excuse me, I feel the importance of laying stress upon the need of knowing on what dirt roads the bulk of our taxes is expended. From my porch or sitting room, I can see a road fully a mile long that is simply a lane for two farms, and during my 32 years in East Goshen, I have never seen the supervisor at work on this road. True, this may be an extreme case; but there are plenty of roads that are lanes for 3, 4 and 5 farms, and that are not thoroughfares; and we know that a single farmer is entitled to a public way out. Thus we have in East Goshen but 5 thoroughfares, covering about 2 miles each, bearing the heavier travel and traffic, and they formerly absorbed our main taxes.

Mr. Cassatt, a vice president of the Pennsylvania Railroad, and for a number of terms supervisor of Merion township, Montgomery county, assures us that a well built road need not cost with saving machinery, over ten dollars per mile for repairs, if properly attended to. The road account of West Goshen, adjoining us, shows that its piece of pike leading eastward toward Paoli has not cost for 25 years over an average of $12.00 per mile. This piece of road has had the advantage, please remember, of the West Chester crusher.

At a certain meeting where the toll road interest dominated, I was met by the statement that a certain toll pike cost $400.00 per mile for repairs. Upon investigating, it was found that at the junction of every road leading to roads paralleling the toll road, there was a family to support the year round, and that the services for collecting toll was charged to the maintenance account. Then again, so long as collectors must be employed, the costly hammer will be perpetuated. The stone for this road was costing 75 cents per perch. Remember, I have not the least antagonism against toll companies, but I am grateful for what they have done.

If these 14 miles of outlying dirt roads did not cost us last year so much as $20.00 per mile, certainly $50.00 per mile will more than pay for the maintenance.

In these estimates, please remember that I use round or approximate numbers.

During our agitation for a road loan, the opposition said that figures did not count. They declared upon the basis of what other townships were paying in cash for 12 feet wide, half mile stretches of hand-hammered pikes, that our loan and roads would tax us a number of mills out of sight. But figures do count. And when it was found that figures counted, and that we paid a full installment on our principal, all the interest that was due, or more than half of the entire interest on our loan, all repairs, beside removing snow, building a new piece of road and paying count, attorney and election fees, all with but a rate of 4 mills, or an excess of one mill over our old tax, they joined in with us last spring, and carried a vote for an additional $12,000.00 with a whooping majority. It is surprising what money a business method will save, and our people were so happily surprised as to vote an additional loans.

Such is now the desire in our township for hard roads that our citizens would have run our road mileage up to ten mills, had not the law limited township loans to seven per cent. of township valuation. Over this percentage we cannot go. Some men will put 50 per cent. of their wealth in their houses, but a township can put but 7 per cent. of its valuation in a loan, whether it be for roads or schools.

Had the citizens of our township been satisfied with the $30,000.00 loan, our extra millage would have been but one mill, and this during but one year. This slight advance in millage under the $30,000.00 loan is the result of our saving in maintenance. We have now saved the most we can now save in maintenance, in that our worst roads are cured of their waste. Thus, whatever road we built last year and will build this, must be paid for out of the principal tax and not repair saving.

Here is a point also worthy of your close consideration. I am firmly convinced that certain townships where the main travel or wear is centred to a third, or perhaps even a half of the entire road mileage where, also, the township is rich in valuation, roads can be built under a loan without any increase of taxation. I submit that this seems a hazardous statement to make in the hearing of a thinking, investigating people; but will you kindly credit me with the statement of Nether Providence, Delaware county, from which we learn that this township borrowed $65,000.00 one year ago, and has now from twelve to fifteen miles of good road, with only a seven mill tax, whereas it was eight mills prior to the loan being made?

True, Nether Providence using its principal sum during the year may not have paid full interest, but the township still has a mill to its credit, with which to pay this interest, if it had not already been paid.

Kindly allow me further to bring at least within an approach to credibility my assertion that certain townships may build roads under a loan without increase of present taxes.

Willistown township, adjoins East Goshen on the east. The valuation of Willistown is nearly twice that of East Goshen. Willistown, instead of building two miles of road to one of East Goshen, proposes to build but three miles more than East Goshen. The supervisors of Willistown have called an election for a loan of $40,000.00. East Goshen's full loan, with a valuation over half that of Willistown, is $42,000.00. Our East Goshen tax just laid is 5 mills. This 5 mills is bearing a burden nearly double that proposed for Willistown. If East Goshen can bear a debt of $42,000.00 at 5 mills, or even 6 mills, cannot Willistown, with nearly twice the valuation, bear a debt of $40,000.00. at 4 mills? Now, 4 mills is the present dirt road tax of Willistown. But further than this, on this point of building without raise of taxation, aside from the proof produced by the Nether Providence operation, aside from my own estimate, I beg to offer an estimate taken from the report of a committee of the citizens of Willistown, appointed at one of the road meetings recently held in that township. The committee consisted of Mordecai T. Bartram, Lewis Smedley, Edward Lewis, Robert Hutchison and James A. Baker. I am confident that there are those among you, who know the character of some of these men for reliability and business foresight. What do these men state as to building 13 miles of road within the old tax? They report:

"In the first place, let us consider what it has cost the township of Willistown for road making and mending the past 10 years, namely, $39,618.31, or per annum $3,961.83, average.

The present basis for road tax assessed is a valuation of $10,865.30, and the rate levied for the year 1893 will be 4 mills on the dollar, yielding $4,346.12. The cost under our present system is therefore per mile or 60 miles, $74.43-100 per mile.

Telford road has been made in a few places in the township, at a cost of an average of not exceeding $3,000.00 per mile, and the work done is eminently satisfactory, showing that for heavy teaming, one half the horse power required upon contiguous un-Telforded roads will amply serve upon the Telford roads. The wear and tear upon these portions is so slight that it can safely be assumed that it can be maintained at not exceeding ten per cent. per mile that it now costs us to maintain our roads under the present system.

This conceded you will see that our present system is most wasteful and unwise.

Why should a farmer be compelled to take two, four or six horses to convey his produce or other material necessary for his business over roads such as we now have generally, when the same work can be more comfortably done both by man and beast, with half the number of horses, and yet this is witnessed as the case every day upon our winter roads.

Our supervisors who have built you the few Telford sections of road that their limited means permitted them to do, the past two years, will assure you that they can build in this township thirteen and one-half miles of road were most urgently needed, at an average cost of not exceeding $3,000 per mile, and the saving thus made in the maintenance of these roads will enable them to do all the other work needed in the township as well or better than it is now done, without adding a penny to the present tax.

"How, you will ask, can this be done? Answer: 13½ miles of stone road will cost, say $3,000 per mile average, or $40,000. This sum can be borrowed at 5 per cent. interest per annum, costing for interest $2,000. A sinking fund of 3 per cent. to extinguish this debt will take $1,200. Total, $3,200. The tax yielding $4,346 from the 4 mill rate will leave for bridging and other necessary work beyond the permanent improvement and maintenance of the Telford part of the system, $1,146.12. Total, $4,346.12.

"It will be seen from the above that this is not a proposition to burden the township with an onerous debt that will be heavily against the taxpayers, either immediately or prospectively, because the plan contemplates immediate provision for liquidating payments on the loan out of the current assessments, made without increasing the tax. Each year's liquidation will diminish the interest to be paid $60, and the principal $1,200, so that at the end of 33⅓ years, the whole loan will have been paid and discharged."

If, on the other hand, East Goshen township had built within what her macadam would have saved in the way of repair, there would have been no raise of tax, but East Goshen wanted no question or risk in the matter. Thus there was added $12,000 to the first loan of $30,000, and thus up to date, we have used $38,500, have 9 miles of road and a millage just laid of 5 mills under our new and entire loan of $42,000, which pays for annual instalment of principal, interest and repairs.

I know that as a discerning people, you will, and very justly, too, watch my loyalty to facts. You surely want that I should prove all things, especially in reference to this exciting road issue without recourse to bald assertion. Frankly, I then admit, that we will pay this year two mills over the old tax of two and a half mills over our average tax of the past ten years. Let me first point, in rebuttal, to the fact that our tax will decrease as we annually liquidate our debt, whereas, on the other hand, dirt road taxes, as a rule, are on the increase. If our township record is evidence, our dirt roads at the end of thirty years would have cost us six mills. If we had delayed until that time the building of our hard roads, our millage would have been eight mills.

Then, second, say, to be safely within the truth, our tax may reach even six mills by flood, storm or accident; then the excess wil be three mills. On our two farms, owned by Mrs. Downing, measuring 240 acres, we pay $21 per mill. Thus our hard roads may cost us at an extravagant surmise, three times $21 or $63 for the highest annual tax. Now, our son earned some $130 in hauling stone for the new roads. With this sum he bought three cows. These cows will certainly return yearly $40 each, or in all $120. So that our three cows, purchased with road money out of the $42,000 loan honestly earned, will not only pay our highest road tax of $63, but will yield a clear profit of $57. Thus, does it not look that at the worst phase of it possible, road making under loans is a good business, money making operation?

It has been said that our ten miles of road will cost us, with interest, approximately $73,500, or $7,350 per mile. This is sternly true. Our opponents used these figures in cold print and the figures scared some of us mightily. But, as against this, we produced on the other side of the account, the indicaed cost of our dirt road repair for thirty years, to-wit: $83,700, leaving a balance to the credit of hard roads of $10,300.

We have been watching this balance of $10,000, and if the law permits, with our worst costliest roads locked up against plow and shovel, with our culverts iron, stone and brick, we can surely find one good supervisor who will give security to maintain our roads for $300. System and the stitch in time are elements of saving in road maintenance that, the chance being afforded, will as yet surprise us. If you will excuse my confidence, gentlemen, I am sure that one supervisor at $25 per month will do more for our roads now than two supervisors as in the past, together with the usual posse of indifferent workmen that we have furnished to work out, or up, if you please, our taxes.

After one of my "road talks," a man came to me, saying between whiffs at his segar, "Mr. Downing, I am afraid you will induce our people to do that which will take the food out of my children's mouths."

I said I did not want to do him or his children harm, that I wanted him to stop wasting his tax and begin to invest it, and turned the subject by asking good humoredly, if he enjoyed smoking. He replied that it was a great comfort. "How many segars do you smoke a day?" "One after meals," he replied; "what kind?" "Two-fors, as a rule;" "does the cost of your segars take so much as a cookie out of your little girl or boy's mouth?" He laughingly replied, "well, no." "Now," I said to him, "suppose we use the mathematics that our fathers and mothers were so anxious that we should have and use. These segars cost you in a year $27.37. Whereas, the owner of a $7,000.00 farm can pay for ten miles of splendid roads at an average tax of less than half your segar money, his average hard road tax being one and one-seventh mills on $7,000.00, equalling but $10.50. In other words, his segars would cost $16.87 more than ten miles of road."

My friend cheerfully turned the subject by saying: "Well, that is a good point about using our mathematics. Teachers should teach children to apply their education. In fact," said he, "I can point you to school directors who are the dupes of their fears and prejudices, instead of the beneficiaries of their education." He was a bright, thinking fellow, but then I thought that he, too, was a little "in the soup" as to roads.

It must be admitted that the money wasted in many public operations is appaling. It is easy to name road operations that cost far more than they should have cost. In fact, the roads of East Goshen could have been built for less than they cost. Let me give you, if you please, one cause of our waste, which was, after all, not great, having bought our machinery and built nearly if not fully nine miles of road for $39,000, including a contribution of $500.

A number of our citizens agreed to become surety for the proper expenditure of the $30,000 loaned, provided the supervisors and the bank would permit these citizens to form a board of supervision and disbursement. The taxpayers in public meeting, thoroughly advertised, fixed in succession where the macadam should be placed. Two of our auditors who had bitterly opposed the loan, refused the security. As an example, I was refused, because my wife inherited the farms, yet the bank where I deposit has loaned me accommodations before and since on my individual note. My wife offered to sign jointly with me, owning two farms, clear, of 240 acres, but a woman in law is simply privileged to pay taxes. Another citizen consented, coming into an estate of nearly half a million of dollars, owning three farms, two of which were mortgaged, simply because he was making two and three per cent. more on his money invested elsewhere. This gentleman was also refused, and thus as to five men offering to become surety.

It was plain then that the motive on the part of the auditors, with one exception, was to defeat our road movement.

But, unknown to these antagonistic auditors, the law did not require any security to be given for this loan money. The gentlemen offering surety, however, knew the law from "A to Z," and thus their offer was purely voluntary, for the prevention of waste and protection to taxpayers.

The intention of the men offering security, desiring to make the taxpayers safe as against themselves, supervisors or all party or parties was simply to organize a directory under authority of which the funds could have been disbursed, the accounts kept by the best book-keeper in the township, the supervisors relieved of dangers from mistakes, the auditors relieved of responsibility and their work lessened and simplified, and no man paid without an equivalent for the money he received. All this, too, without a cent of charge upon the part of the directory. I would be untrue if I left unsaid, that it is wonderful what mischief ignorance and vindictiveness will work at times.

RAINFALL AND TEMPERATURE.

BY N. F. UNDERWOOD, *Member from Wayne, Lake Como, Pa.*

Among all the influences which affect, favorably or unfavorably, agricultural production and productiveness, none are more potent than rainfall and temperature. That heat and moisture are indispensable to the germination of seeds and the growth of plants, are facts too well known to need repetition; and were the supply of each always constant, always sufficient, and never in excess, we would regard these as we do the daylight and the air we breathe, with only passing interest. But situated as we are in the northern temperate zone, with our year divided into a season of active vegetable life and growth, and a season of complete dormancy of the out-door vegetable kingdom, with a wide variation in our summer and winter temperature, and a radical difference in the kind, if not in the degree of the precipitation allotted us, with also a constant variableness (the only constant feature of our climate) in the temperature and precipitation of each succeeding year, the subject under consideration appears to us as one ever new, always of interest, and one about which it is difficult to reach definite conclusions. The daily and weekly bulletins of the weather bureau, together with the signals and warnings of its widely ramified system of signal service stations, evidence the importance of these ever active agents in what goes to make up the total of those physical conditions which we generalize under the terms "climate" and "weather." While these forces of nature have not ceased their activity since the sun began to shine upon the evil and the good, and the rain to fall upon the just and upon the unjust, yet it is only within a recent period that any systematic attempt has been made to study the phenomena and laws of weather changes and occurences, with a view to a useful forecast of what the coming days or weeks may bring forth. One result of the efforts made in this direction has been the rise of a succession of theorists, or weather prophets, who, one after another, have put forth sensational predictions of coming disturbances and disaster, yet each in turn has been discredited by failure, and thus some names, for a time widely quoted, have been speedily forgotten; yet by a careful observance and record of facts concerning storm movements and occurrences, substantial progress has been made toward a knowledge of the laws governing wind and weather, and much practical benefit has resulted, and much damage been averted by timely warning of approaching disturbances. Predictions concerning the weather and the interpretation of weather signs have long been indulged in, and the literature of many nations contains stories of weather wise saws and maxims; but the prognostications of our ancestors make no mention of our storm centres, or areas of low barometer.

It is not our present purpose to attempt a scientific treatise upon climate, or to compile a cyclopedic statement of the amount of annual precipitation in the different countries of the earth. This amount varies from rainless or nearly rainless, and verdureless regions, to those excessively humid localities of other continents where fathoms of water descend in a single day, the amount being everywhere determined by local configuration and situation, and in which latitude, nearness or remoteness to seas, lakes, water courses, and mountain ranges, play an important part.

Our own country, and our own State, are so fortunately situated that aside from a few localities, and occasional departures, the rainfall is abundant for our needs, and we may say that when conditions of moisture and temperature are normal, they are also favorable, and it is only when wide or long continued departures occur that serious loss and damage are sustained, yet there is withal a tendency to unequal distribution, both as to regularity, and as to locality. Our average annual rainfall, east of the Rocky Mountain region, is a medium one (30 to 45 inches) compared with the very dry, or very wet conditions elsewhere prevalent, and for a period covering a score or so of years, we can calculate with tolerable certainty what amount of rain and snow will fall upon our fields and woodlands; but for a single year, the tendency to extremes, and to capriciousness renders it impossible to make any practical forecast. We plan to sow our seed at the regulation time, and perhaps for a year or two, conditions are propitious, and we start the season's operations on time, and everything up to date, but when the time of sowing again returns, the rain is falling, the ground is saturated, and this condition continues until we are ready to say that the promise of seed time has failed, and we sigh for an ideal climate, with rainless skies, and water brought to our fields from the mountains in an irrigating ditch. The rainfall and the temperature are the uncontrolable factors in the agricultural problem, the unknown quantity in the equation of husbandry, and because we cannot control them (and we speak with all due deference to the professional rainmakers), we are never quite sure that our plans may not miscarry, and our estimates prove wide of the mark, until the harvest time comes and our crop is ripened and safely stored. Efforts in the direction of bringing the water supply and distribution within control have not been wanting, and have resulted in irrigation systems on a large and beneficient scale in the mountain regions, whereby much otherwise waste and barren land has been made to produce, in abundance almost beyond belief. In a more limited way, artesian wells have elsewhere tapped the subterranean water strata, and overflowed and made verdant the parched deserts surrounding them. Compact and springy soils have, in many localities, been relieved of their excess of moisture, and brought to a condition fit for tillage, by underground drains. Much of this work has proved of sufficient permanence to be profitable, with much increase of productiveness and value. Systems of storage ditches have also been tried, in a limited way, for which much is claimed by enthusiastic advocates. Last, but not least, persistent stirring of the soil in time of deficient rainfall has often been resorted to, and the testimony of many who have practiced it leaves no reasonable doubt as to its efficiency as a means of averting in a good degree the more serious effects of drought. Whether, on the whole, the crops of the country suffer most from excess, or deficiency of rainfall, is a question not easy to determine. It may be said that as a rule, dry periods take a wider range, and are of longer duration, while the more destructive floods, cyclones, and hail storms, are more local in their devastation, and usually of short continuance, though they utterly destroy in a few days, or a few moments, the entire season's product. As with the rainfall for variableness, so also the thermal changes incident to the recurring seasons take place with little regard to regularity. The equinoxes occur in their season with commendable promptness, and the almanac makers tell us that on a certain set day and time, winter ends and spring begins; but the changes of temperature do not occur in quite so prompt a fashion. Winter so often lingers in the lap of spring, and the "ethereal mildness" of which the poet sang is tardy in arriving. The frost king may even return some night in June, and leave the mark of his unwelcome presence on the tender leaves and shoots of the unfolding vegetation. The November snows cut short our too brief Indian summer days, and the blasts of Boreas chase away the gentle southern zephyrs.

To what an extent unfavorable conditions as to moisture and temperature may affect the crops of the United States, the experience of 1893, bears abundant evidence. Five among the most important staple crops, wheat, corn, oats, potatoes and buckwheat, are 25 per cent. short, with cotton, the great staple croy of the South, 30 per cent. short, directly caused in very large degree by deficiency of rainfall and uncongenial temperature. Pennsylvania, usually more exempt from excessive departures than many other States, comes in rather below than above the general average. To realize the enormous extent of this deficiency, it must be figured out into bushels and dollars. Yet in the face of this vast shortage from a full crop, we find prices lower than for years, lower indeed in many instances than the actual cost of production will warrant. To attempt to account for this abnormal condition is foreign to the subject of this paper. Every cultivator of the soil knows how much in seeding time depends upon having the ground neither too wet, nor too dry. If too dry, the earth breaks up, with great expenditure of muscular force, into lumps and clods, and no reasonable amount of preparation will bring it into a fit condition for the seed to germinate and begin to grow. If the soil is saturated with an excess of water (and how often this condition does seem to occur in spring planting), the crop is injured and the ground baked by stirring it at such a time, or the planting is delayed beyond the proper season by waiting for clearing weather. And after the crop is in the ground, and growth has commenced, and the time for tillage has arrived, how anxiously the farmer watches the wind and the clouds, for the weeds are growing as well as the young plants, and if rain comes too copiously and tillage is delayed, the weeds are getting a hold upon the soil that will make it doubly difficult to dislodge them. And then too, at this stage of growth, how necessary are genial skies and a balmy air to green the leaves and impart vigor to the stalks, that the natural progress of developement be not retarded; frosts too, may come, and nip the tender shoots and bring to naught the promise of a harvest. And so through all the growing season, and until the harvest time, the early and the latter rain are needed, yet withal in moderation, and the corn and the vine, the fruit tree and the waving grass, rejoice in the sun when he shineth, and gather new life and vigor from the gentle rain and the refreshing dew. It is not alone in crop production that rainfall and temperature affect our well being and our interest. The great question of water supply for ourselves and our animals depends upon regular and adequate rainfall. The source of supply for a city and town, for village and farm, must be kept full and pure, that our people do not suffer in point of comfort or of sanitation; and a water famine anywhere is even a more serious matter than a food famine.

The protection of ourselves and our animals against the vigors of our winter climate is also a matter requiring, and fortunately now receiving much attention. Stock owners are fast becoming impressed with the idea that economy as well as humaneness requires that they provide comfortable quarters for their animals. This matter, at least, is one entirely within their own control, and if proper provision is made (and this should include water supply for winter use as well as shelter) no cold wave moving in our direction need affect the comfort of our herds. The storing of ice in winter for summer use, and the many improvements in apparatus for keeping winter's cold from our dwellings, are all in the line of efforts to maintain a more equable temperature in spite of the changing seasons. The subject of aqueous precipitation and its variable distribution abstractly considered, has long received investigation. Some things in relation to it we know, and more of its mysteries may in time be learned, but the causes upon which possible regularity of occurrence must depend are themselves so utterly inconstant and irregular, that their effects must of necessity be of like character. We know that all precipitation, wherever it takes place, is due to condensation of moisture carried up into the atmosphere in the form of vapor, that the process of evaporation is constantly going on, that the heat of the sun is the great lifting engine, and that while lakes, rivers, woods, fields, and all moist surfaces furnish their quota, the tropic seas are the great source of the aqueous supply, that the daily draft from the land and the seas, to maintain an equilibrium and furnish material for the rain, hail and snow that descend, would amount if gathered together, to some hundreds of cubic miles of water. We know that the vapor laden air is blown by the four winds of heaven, and by all the changing and shifting winds of earth to the uttermost bounds of our planet, some of the burden is dropped as snow at the poles, to thicken in time the ice cap which envelopes them. Some falls upon snow crowned mountain peaks to form a portion of some slowly creeping glacier, at the foot of which it finally emerges; then, breaking off in the form of an iceberg, sets out in its long journey to the warmer seas, where, after the lapse of ages, it completes its round of travel, mingles with its parent waters, and is ready to start anew. Some of it, carried to and up the mountain ranges of the temperate zone is rapidly cooled and condensed and falls in torrents on the mountain sides and the adjacent lowlands. Other portions are driven here, there, and everywhere, as the fickle winds chance to blow, and fall in gentle showers or downpouring storms, on hill, and vale, and plain. The changing seasons with their varying temperature, the shifting air currents, the broken configuration and topography of the land surface, as well as the arrangement of land and water, are all elements which militate against regularity and uniformity of distribution. Not until these warring and jarring elements can be harnessed and brought under control, can we expect to have climate and weather made to order.

When we consider the question of temperature, from force of habit we are apt to regard heat and cold as widely separate and opposing forces, whereas they are only manifestations in different degree of one and the same force, a force the power and intensity of which human beings know, and can know, but little. Their senses are attuned to a few degrees of a wonderful scale, and above and below all mortal knowledge and comprehension the octaves rise and fall to heights and depths beyond our power of conception. All the animal and vegetable life of the earth is circumscribed within an exceedingly narrow limit. The process of acclimation has rendered the animals and plants of each zone in some degree hardy in their own particular habitat; but a sudden transposition of the artic and tropic species would speedily result in the annihilation and extinction of both, while those of the temperate belt transported to either the colder or the warmer zone, would only survive in part, and the survivors would require ages of time to adapt themselves to their new environment. Just what the range of temperature is that bounds possible life upon the earth cannot be positively asserted, yet we may safely assume that a range of 300 degrees would bring us perilously near the limit at each extreme.

The actual range of temperature to which our planet is exposed may be taken as in some degree indicating the measure of our capacity in this regard. While the life upon the earth is thus guarded from too great extremes by the adjustment of the sun heat which we enjoy, human beings in their various useful arts, and especially in their scientific experiments, produce artificially, degrees of temperature of startling intensity. Not only have they succeeded in melting the hardest know substances (irridium melting at 2,700 degrees Fahrenheit), but have pushed their experiments until the claim is made of a record of 7,200 degrees by electrical apparatus. Even in so prosaic a matter as the manufacture of crucible steel, by the Siemens process, the charge is maintained at a temperature of 4,000 to 5,000 degrees, in the reverberating furnace. On the other hand, cold has been produced of sufficient intensity to render the air we breathe liquid, and the latest results record a temperature of 490 degrees below zero, which is believed to be near the temperature of space. What is the absolute zero of temperature, no one is at present bold enough to assert. "But," says my practical listener, "all this is unpractical and unprofitable. We don't want anybody's theories, or speculations. That may be true; the trouble is we cannot always tell just what is practical. The ice-machine, so necessary now in warm climates, had its inception in a theory. Sir Henry Bessemer, whose process of steel making has added more to the wealth of the world than anything else in his generation, started out with a theory. Not only was he not a manufacturer of steel, but he knew nothing of the process, except the chemical principles involved. Franklin would never have made his experiments with his kite and string, if he had not had a theory at the other end of the string. And so with Morse and Field, who gave to the world the telegraph and the submarine cable. And so of Edison and Tesla, in their brilliant achievements in electrical science, and today the world is waiting until the imagination of these wonderful men, touched by the wand of science, shall settle for them the most vitally practical problems that ever engaged the attention of mankind; problems that when thought out, and worked out, shall bring into control for the use of mankind, the subtle forces of nature, and the wildest dreams of by gone ages shall become the practical verities of the time to come. It is perhaps too much to expect that we shall ever be able to control the wind currents and the clouds, yet let us not in this age set a limit to what the ingenuity of man can accomplish in any chosen field of effort.

MANAGEMENT AND CARE OF BEARING ORCHARDS.

By G. Hiester, *Member from Dauphin, Harrisburg, Pa.*

In arder to secure the best results from our orchards, we must understand the natural laws which govern the growth of the tree and the production of fruit, and place our trees in such a condition that they will—in obedience to these laws, produce regular crops of the finest fruit.

The plant-food contained in the soil is dissolved by rain falling at frequent intervals, and in the form of a watery solution; it is taken up by the roots and conducted in this condition directly to the leaves, which have been very properly named the laboratory of the tree. Here, in the leaves, this watery solution is changed to sap, and goes from the leaves to the various parts of the tree, to form new wood, fruit, spurs and fruit at the proper season.

If the supply of plant-food in solution is abundant, the leaves retain it but a short time, and send it out in a very crude form, new wood being the result. The larger the supply and the more rapidly the leaves are obliged to work, the larger the growth and the softer the wood thus formed. If the supply is restricted from any cause, the leaves retain it longer and work it over more thoroughly; this double-worked sap goes to the formation of fruit spurs, and on trees, like the peach, which do not produce spurs, it goes to the formation of fruit-buds.

Our success, therefore, depends very largely upon keeping up the proper balance between the growth of wood and the production of fruit-spurs. If we find that our trees are growing luxuriantly, but are bearing no fruit, we can check their growth by planting some exhausting crop between them for one year; or if we have been cultivating the ground and fertilizing heavily, we can accomplish the same result by seeding to grass without manure. Anything that will check the growth will cause them to fruit. If, on the other hand, we find that the fruit spurs are becoming crowded and the trees are exhausting themselves by overbearing, we must feed them better, and thin out the fruit spurs where they are most crowded.

This matter of food supply is especially important to the peach. Most of our orchards bear one or two crops and then die of the "yellows"—while we must all admit that there is a disease called "yellows," for which no remedy has yet been found. I am perfectly satisfied from my observation of numerous peach orchards, that in nine cases out of ten, "yellows" is only another name for starvation; or, at least, that starvation has placed the tree in the proper condition for "yellows" to find a lodgment. Chemical analysis shows that the ash of the wood and fruit of a diseased tree contains 14 per cent. less potash than the ash of the wood and fruit of a healthy tree.

As soon as the fruit spurs or buds are formed, the tree, obeying one of the laws of reproduction, devotes its first and best effort for their support, and only the surplus is allowed to go to the formation of wood. So we see that our trees, stimulated by the large amount of food dissolved by the spring rains and offered to them in abundance, will throw out a blossom from every fruit spur, and will carry and nourish these blossoms just as long as they have the strength to do so; but, as the heat increases and the moisture gradually leaves the soil, the supply of available food diminishes, and the tree is obliged to relieve itself of a part of its load; hence follows what is known as the June dropping of apples. They drop because the tree is no longer able to nourish so many, and the number that remain on the tree is determined entirely by the amount of available plant-food in the soil.

If you will examine any orchard containing trees of different ages, you will find that the finest fruit is grown on young and vigorous trees, and among the older trees, the finest specimens are found on young wood, on fruit spurs bearing for the first time; therefore, we should keep up a constant supply of young and vigorous fruit spurs, by forcing some new growth each year, by the application of fertilizers, either home made or commercial, and by thinning the old fruit spurs on branches where they have become over-crowded.

A fruitful year is much more exhausting to the tree than the off-year, hence, when we see that a large crop of fruit has set and is likely to escape late frosts and other disasters, we should give the orchard a special dressing of manure to enable the tree to carry as much as possible of the crop to maturity, and, at the same time, make a new growth for next year. If we watch this point carefully, we will have fewer "off-years" and our profits will be increased proportionately. By careful attention to this one point alone, we could secure regular crops of the finest fruit, if it were not for the insect and fungoid enemies; but, alas! after we have brought our tree to the highest state of perfection, and placed an abundance of nourishment in the soil to bring the crop to maturity, we find our hopes blasted, our fruit marred, and in many instances, destroyed by these pests.

In the spring of the year when the trees begin to put forth their leaves, when the air is so balmy and pleasant, when everything about us is filled with new life and hope, after the long winter's rest, we find that the spores of numerous fungoid diseases, chief of which are the the blights and mildews, are thrown upon the air; and this atmosphere which seems so wholesome and pleasant to us, is actually filled with minute organisms, which are floating about, unseen by us, settling upon every leaf and twig in our orchard, there to spread and grow; and as they grow, marring both fruit and foliage.

We find this lovely atmosphere also teeming with noxious insects, all actively engaged in the selection of suitable places to lay their eggs and rear their broods; and they find no place so much to their liking as our orchards. The codling moth lays its eggs in the blossom of the apple and pear, just after the petals have fallen. When hatched, the young grub eats its way into the center of the fruit, causing it to drop prematurely. The borer lays its egg on the trunk of the tree, under some over-hanging bark, where it will be protected from the weather and hidden from sight; the grub when hatched eats his way under the bark, where he makes his home, eating in every direction entirely unseen, his presence unsuspected until the lack of vitality in a part or the whole of the tree, tells us of his deadly work; and so we find myriads of other insects attacking every part of the tree, from the root to the topmost leaf.

Owing to these causes, the condition of the fruit grower a few years ago appeared almost hopeless; but, thanks to the persistent efforts of a few broadminded men, and the intelligence and bounty of our National government in the establishment of agricultural experiment stations in the various States of the Union, a way has been found by which our fruit may be saved, and some of the profit retained for one of the most pleasant and alluring employments of man.

After a number of years of careful experimental work at these stations, it has been discovered that Paris Green, mixed with water in the proportion of one pound to 200 gallons of water and sprayed over the trees just after the blossoms have fallen, will save our fruit from the ravages of the codling moth to a very great extent. If we are careful and thorough in our work, we can save as much of our fruit as the trees are able to bear. It has also been discovered that the salts of copper, either alone or combined with lime and mixed with water, in the proper proportions, will prevent the spread of all forms of mildew, and other fungoid diseases which attack our trees, mar the fruit, or destroy the foliage. If these experiment stations had never made any other discovery, the results of this one would amply repay all the expense incurred in the establishment and maintenance of all the stations up to the present time.

The various solutions used and the methods of application have been so fully described in the bulletins of the experiment stations that I will not take up your time with a description of them, but will only say that after following the directions therein contained faithfully for four years, I am satisfied that large crops of perfect fruit can be grown, and a profit secured, in spite of the codling moth, apple scab and leaf blight, by the intelligent, persistent use of a good spraying outfit. For every $100 spent in spraying, I have received at least $1,000, that I would not have had without spraying. We obtain not only better fruit and more of it, but less labor is required in harvesting. The imperfect fruit drops to the ground and can be gathered as it falls, and sold at a low price during the seasons, and when picking time comes, there is nothing left on the trees but perfect fruit, which can be taken direct to the bins without assorting, and will keep until you can find a market for it. After you have handled this kind of fruit a couple of years, you do not have to find a market—the market will come to you.

Not only is the fruit better and more valuable—but by protecting the leaves from insects, mildew and blight, they remain on the trees longer, are in better condition to do their work, and as a result, we have better wood for next year. Our trees do not require so long a season of rest, and we have fruit every year. The old saying, "an ounce of prevention is worth a pound of cure," is as true in this case as in any other; therefore, we should break up the winter haunts of insects by removing all rubbish from our orchards, and by scraping the trees and washing the trunk and large branches with soft soap, so as to promote a smooth, clean growth that will not furnish shelter for them.

Without going any farther into details of the management, etc., I would sum up as follows:

When our trees have reached the bearing age and have commenced forming fruit spurs, we should fertilize liberally, to keep up the proper balance between wood and fruit production. Supplement this by judicious pruning; keep your orchards absolutely free from all kinds of rubbish that would form a harbor for insects; allow no rough, shaggy bark to grow on any part of the tree; spray faithfully and intelligently, and leave the rest to Providence.

THE FARMER OF THE FUTURE.

BY D. H. PATTERSON, *Member from Fulton, Webster Mills, Pa.*

In no other country, perhaps, has agriculture been so prosperous as in our country. The conditions have been favorable to its best development. Through all our past history, the safe and conservative element among our people has been made up largely of those who have been interested, either directly or indirectly, in agricultural pursuits. In the last one hundred years greater progress has been made in the arts and sciences than for the previous eighteen centuries, and yet it is not too much to say that agriculture has kept fully abreast of all other pursuits. In adapting means to an end, in the invention of machinery of all kinds to aid him in his work, in the discovery of the elements of the soil, which go to make up plant life, and the ingredients of which plants are composed, the farmer perhaps has made greater progress than those engaged in any other industry, until to-day, he is better able than ever before to hold his own in the great struggle for material prosperity which is constantly going on in the world.

He has improved his condition in many ways. He no longer farms as his father did, not that our fathers did not do as well, or better, under the conditions surrounding them than we. They did the best they could with the advantages they had and the circumstances which environed them; but our advantages to-day, are so much superior to theirs, and the conditions of our environment so different that we ought to be better farmers if we are not such. But, judging from the past and the present, what will be chiefly characteristic of farming in the future? What qualifications will be required to make the successful farmer of the future? He will be a scientific farmer; he will need to understand better than now the science of farming;

he will be thoroughly familiar with the business in which he is engaged; he will know all about the soil he cultivates; what elements of plant food it contains, and in what proportion, and what elements are lacking and how he can supply those that are wanting. He will know the scientific effect of light, heat and moisture on the different food products of the earth, and knowing all these, he will be able to make the very best use of the capital which the God of nature has freely placed in these elements ready at his command. He will know what kinds of products are best suited to the soil he cultivates; those which he can raise in the largest qualities. He will also know how best to use all the wastes of the farm. Many things which are now thrown away as useless or allowed to go to waste, will then be brought into profitable use. He will find a fortune in what has hitherto been thrown away as useless. He will be able, because necessity will drive him to it, to make the most profitable use of all the materials at his disposal. He will also know how to get all the possible profit out of his products. The sharp competition which he is now feeling is already driving him to study more closely the markets which his products are destined to reach. He will eventually crowd out the middle man who now fattens on what ought to be his legitimate profits. In twenty-five years from now, I verily believe the middle man in almost every line of business will have become extinct. The signs of the times all indicate the coming about of this condition of things in the field of commerce. The jobber, the commission man and the country merchant are being gradually, but surely crowded out. The producer and consumer will be brought directly together, to the advantage of both. In a word, the farmer of the future, driven from every side to study all the details of his calling, will be as familiar with it as the manufacturer, the mechanic or the professional man is with their vocation. So much for what the farmer of the future will be, so far as his material prosperity is concerned. He will be the substantial citizen of every community.

In intellectual advancement and development he is also destined to make still more rapid strides. The fact that he will be compelled to overcome so many obstacles which will require the close application of his mental powers, will tend to develop and strengthen them, and the fact that his store of knowledge, as it applies to scientific agriculture, will have to be constantly enlarged, will add to his general knowledge and thus make of him a broad minded man of affairs. He will necessarily make a study of agriculture from every standpoint, and will accumulate a vast store of knowledge on co-related subjects. He will be a more intelligent man. The American farmer is an intelligent man, conversant with the current events transpiring throughout the world, but in a higher and broader sense, he will, in the future, be intelligent to a degree not possible now.

The farmer of the future will be fitly represented in every department of government. He will no longer take a back seat and follow where others choose to lead. He will have the strength of mind, vigor of body and independence of character which will peculiarly fit him for taking a leading part in framing impartial laws and shaping the policy of our country, at home and abroad. In the years to come, there will be found many men in the quiet walks of farm life who, like Cincinnatus, in the days of the old Roman republic, will be called again and again to sit in the councils or to administer the affairs of State.

Again, the farmer of the future will be a reformer. These are the days of too many sham reforms. The true reformers are those who toil with brain and muscle. The coming farmer will be a leader in every movement for the good of the community and the uplifting of his fellow men. He will be in favor of a broad and liberal education to all; he will be quick to take advantage of our beneficent public school system, and to secure the advantages from it for the country which are now enjoyed by the cities and larger towns. He will favor graded schools; he will have in every township a public high school, where all the children in the community will have the opportunity to secure free, a higher and broader education; here our boys and girls of the country can at least get a start in a scientific or classical education, which will enable them to follow any career they may choose, or for which they may be specially endowed, and which would make them better farmers, better mechanics, better business men, better wives and better citizens. This, in my opinion, is the first reform to which the farmer ought to give his attention. He pays out much in the way of taxes for which he receives little, which nearly all inures to the benefit of others; but the time is here when he ought, and when he will try to reap some of the benefits himself.

It is just along this line that the question, "What is to become of the farmer boys?" is to be solved. Are we to keep them at home, will we try to stem the current which is carrying so many boys from the country home and farm, to enter the shops, stores and offices of the cities, where so many of them eke out a poor and miserable life, or fall victims to the manifold temptations of the city? Here is the solution: Let us create in our own communities the means by which our boys and girls can secure better educational advantages, without direct cost to them, and without having to leave their homes; and with these free, public high schools, there should be public libraries, containing good, substantial literature, free to all in the community, together with courses of lectures during the winter season. These will come in the near future, and with them, as the necessity arises, inventions and improvements in machinery, which will further lighten the labor and lessen the cost of farm work, so it shall be no longer a drudgery but a pleasure. The hours of labor will also be shortened, so that there will be along all lines of activity an equal amount of time devoted to mental improvement, dividing the day into three equal periods of eight hours each, for work, leisure and sleep.

Again, in the near future, there will be better facilities for getting from place to place in the country. The want of easier and more rapid means of communication in the country districts is a great drawback to our material advancement and intellectual development. The time may not be far distant when the application of electricity as a motive power will be so cheaply done that we will have electric railways along all the principal highways of travel in every community. Time is becoming too valuable to spend so much of it on the roads, as we are now compelled to do.

When these and other improvements come to pass, what a pleasure it will be to live in the country; then our boys and girls will be glad to remain on the farm. The farm will attract the enterprising and ambitious. It will be a stepping stone to advancement. It will secure a prominent position in the community; the farmer of the future will be a public spirited citizen; he will be the conservator of our institutions, religious and political; he will represent the highest type of American manhood, ever ready to defend and to resist any encroachments upon his political rights.

But what of the farmers' wives of the future? She will be his equal; she will stand beside him as she does now, demanding and receiving the same considerations which he receives; advancing as he advances. The inventions of the future are destined to lighten woman's work on the farm as well as man's. She will be his intellectual equal; she will be the queen in her own house; and out from the future farm homes will go the boys and girls who will reform and rule the world.

THE SEED BED AND CROP CULTIVATION.

BY CALVIN COOPER, *Member from Lancaster, Bird-in-Hand, Pa.*

Among the hindrances that lay in the way of the tiller of the soil, many can often be traced to a want of proper study or forethought of the requirements that will bring about proper germination, and healthy growth. It is a common practice among the average farmers to plow and sow, as inclination seems to dictate, scarcely for a moment considering the condition of the soil, and the many little requirements that are necessary to produce the best results. They rarely consider the advisability of testing the germinating quality of the seed, which they propose to sow, and from which they expect to reap the harvest. Right here allow me to urge the importance of examination of all field seeds, under a microscope, and test their germinating quality before sowing. Those of you who have not done so, will be surprised at the amount of imperfect and worthless stuff put upon the market as first-class seed.

When we realize that there are in much of our most valuable grass seeds many thousands of seeds to the ounce; and from the diminutive kernel, how delicate the germ as the first stage of growth makes its appearance, can we wonder why there are so many disappointments in getting a good set of plants?

The first requisite, therefore, is proper preparation of the seed-bed, and the condition of the soil, as to proper tilth and fertility. Many failures occur from undue haste (especially in wet, cold springs), to plow, harrow and sow before the soil is sufficiently dry, and in a condition to nourish the little plant in its search for food. I have seen and realize many misses from this cause alone. In our section of Lancaster county, we have a clay loam with some flint, and a stiff, yellow clay, subsoil, and we find it of the utmost importance to neither plow nor cultivate until the soil is sufficiently dry to crumble up finely under the implement. We should never see that glossy appearance, which is common when too wet, and is a sure indication the soil will bake after every heavy rain and remain hard and rough through the whole season. But, if cultivated when in proper condition, it can easily be kept in that loose and friable state, so conducive to success in promoting plant growth. This caution and care is, however, not to the same extent necessary in a shale or sandy loam, where the drainage of surface water and also that in the soil is more rapid, hence can be handled much earlier.

Having prepared the seed bed and tested the seed to be sown, the next consideration is how deep to plant. The best results will be obtained if the previous preparation is complete, to cover from two to four times their diameter with fine soil, according to the strength of the germinating power of the seed. It is a well-known fact that when the seed has been covered beyond the proper depth, the seed will lay dormant in the soil until brought sufficiently near the surface where the air and sun light will start germination. I have frequently, in our own experience, had abundant proof of this fact. In working our nursery ground, it is no uncommon occurrence to have quite a growth of clover, where no seed had been sown for years. Another important matter is to have plenty of available plant-food near the surface to supply the needs of the plant, at the time it has exhausted that stored in the seed for this purpose. This, possibly, is the most dangerous period, and unless there is sufficient plant-food available, the tender rootlets cannot perform their function, and the plants starve.

A forcible example occurred on an adjoining farm last summer. At harvest time, I went over to see them cutting a field of fine wheat, and noticed quite a difference in the young clover. About two-thirds of the field was sparsely set and small, while the other part was thick on the ground and strong; so marked was the difference, that we could see it almost to the drill row. Upon inquiry as to the cause, the owner said he could not account for it. The clover seed had all been sown at the same time and in the same quantity, but upon reflection as to the preparation of the ground, it was recalled that the two-third part of the field had been manured soon after harvest, and the whole field plowed early, and just prior to seeding time, the balance was manured on the surface, and the whole field harrowed and seeded in the same manner. This field to my personal knowledge, had been farmed in field crops for several years, with scarcely any vegetable fibers left to decay upon the land, and, consequently the humus so necessary in all clay soils, had largely been exhausted, leaving the surface of the soil not only poor, but too compact to make a good seed bed. In this case, the surface manuring and worked in near the top of the ground, not only kept the soil open, but furnished the young clover plant, food at the right time and place.

The failure in recent years to obtain a good clover set, I believe to be, in part, attributable to the want of proper caution in selecting the time to sow. I have frequently heard farmers say they must sow when the ground is cracked open, the seed dropping into the cracks and growing from the covering obtained there. To satisfy my curiosity, I have examined these cracks, and find them often three to six inches deep. Now, it would be impossible for the clover plant to come up from such a depth. But, if our farmers would carefully observe the condition of the fields, which they wished to seed in clover, and sow the seed on some frosty morning, when the ground is slightly frozen and honey-combed with little icicles which afford the very best possible conditions, and covers the seed a sufficient depth to insure growth at the proper time, they would meet with success. This it is claimed by some is to early; others say the seed gets in too deep; but there need be no fear of either. If the seed be good and is put there in proper quantity, there will be a less proportion of failures, unless it is destroyed by the elements.

Having obtained a good set of plants, the next most important matter is crop cultivation. It is a too common practice, to wait until the weeds have obtained a good hold, and then start the cultivator. This is an extravagant and dangerous policy, as moist weather may retard the operation, when the weeds will likely lead in growth, and absorb the very elements that were intended for the planted crop. If farmers would but realize how much easier it is and the great saving of vexatious labor, by cultivating, if necessary, even before the crop is up, with a light fine-toothed implement that will not more than break the surface soil. This method not only destroys millions of weeds that abound on all good farms, but aids the sown crop, by letting in the air, which, coming in contact with the cooler soil, condenses the moisture in the atmosphere and nourishes the young plant.

Each succeding year of my experience in growing field crops, convinces me, that we do not, as a rule cultivate as we should. During the last year of excessive drought I experienced the most forcible illustration of the importance of thorough cultivation, as a means to bridge over a dry time. Two fields of corn adjoining land, naturally. were equally good; one a good sod and heavily manured, the other, corn stalk ground, no manure. The sod field was planted early and had a splendid start; was harrowed two or three times and scraped before haying time, giving promise of a fine crop. The stalk ground was plowed and planted about the 10th of May, and had the best possible preparation; the cultivator was put in about every ten days, or when rain intervened, just as soon after the ground was sufficiently dry to work up fine and loose. This treatment was continued until the corn was shooting tassels and above the horse's back, when the dry weather set in; and that was when the cultivation showed its effect on the crop. The adjoining field in which the cultivator had not been seen for three or four weeks, wilted every day badly when there was bright sunshine, and seemed to be at a stand, while the other stood out fresh and green, and continued to grow, showing conclusive evidence of the importance of better cultivation.

A few years since, I, among others were invited to visit a friend who had conceived the idea of cultivating his wheat fields twice or three times during the spring months. His manner of treatment was something like the following: At seeding, each alternate tooth of the drill was removed, and the following spring, as soon as the weather was settled and the ground firm, the drill was supplied with a three or four pronged cultivator, thus thoroughly breaking up the soil in the spaces where the tooth had been removed. The result upon the crop was very marked; never have I seen such heads, well-filled with the finest of wheat. The yield was said to be nearly sixty bushels per acre, and I also saw at the same time a magnificent set of clover which was sown immediately after the last cultivation. But the practicability of cultivating wheat to sell at seventy-five cents a bushel, does not, to me, seem a very lucrative industry.

Past experience and observation in the age of the extravagant use of commercial fertilizers as a means of producing crops, with the constant cropping of the soil, without the use of the old-time barnyard manure and other vegetable foods, will, I very much fear, 'ere long, exhaust the soil of humus,—the most valuable of all other matter in its mechanical effect in promoting plant growth.

RELATION OF FARM LANDLORD AND TENANT,

By D. Z. SHOOK. *Member from Franklin, Greencastle, Pa.*

"Live and let live," is a maxim which, if more fully carried out in business, would prevent four-fifths of all the contentions, strife and irritation that so often arise to destroy the peace and profits on both sides of many a contract.

In scarcely any relation of business does capital and labor clash more than in the relation of farm landlord and tenant. True, there is no organization of either of the two contending classes against each other, no walking delegates to inflame the passions, nor autocratic leaders to call a "strike" to disturb the peace and business of the community; but, for all that, the contentions are just as earnest, the unrest just as great, and the gulf just as wide between the two classes of landlord and tenant farmer, as between the labor unions and capitalists in railroads and the manufacturing industries.

To mention the contentions constantly occurring between farm landlord and tenant, and to tell how they come about, is easy enough; but to find a remedy would be as difficult as to solve the great problem between capital and labor generally. One thing is certain, hard times and low priced products tend greatly to intensify the often strained relations and dissatisfaction, because neither side is content with what he is getting.

It has been said that landlords who do not follow the maxim of "Live and let live," write up the article of agreement between themselves and tenants, and beat the tenant at every point until the tenant moves on the farm, and then, the tenant beats the landlord at every point and in every transaction until he moves off the land. Such a tenant leaves the premises in a racked and uncared for condition, and thus gets a bad reputation as a farmer, and by his questionable methods to get even with a grasping landlord, loses his reputation for honesty and integrity, and with these disadvantages starts out to rent another farm.

The landlord looks around for another tenant to take the farm, at his own hard terms, and generally succeeds in either getting an incompetent man or another downright rascal; for an honest man cannot accept the terms. Very often the sons or wife of the tenant are at the bottom of the dissensions and disagreements with the landlord; they are the disturbing power behind the throne, and while the tenant may have signed the agreement in good faith, the boys and wife manage to have it broken. Most hostile sentiments are sometimes expressed towards the landlord or are hidden in the hearts of the sons, and they are resentful and foment discord; for they believe that their labor is keeping up the landlord and his family in idleness and luxury. So much has this evil feature grown, at least in southern Pennsylvania, that landlords now first make diligent inquiry regarding the disposition and character of the applicant's wife and family before entering into negotiations looking to the renting of their farms.

Greatly changed conditions in agriculture and abnormally low prices for products have somewhat changed the relation between landlord and tenant, and yet it must be acknowledged, these changes have affected the landlord more adversely than the tenant. The tenant who "farms for the half," as we call it in southern Pennsylvania, generally gets all the hay and fodder, gets good, remunerative prices for his dairy products, hogs and poultry, and consequently has only suffered from the fall in the price of wheat, for he has the opportunity of turning his share of the corn into well paying products by feeding it, and has even done the same profitably with his wheat; while the landlord, under our system of renting land, "for the half," at least in the Cumberland Valley, gets his whole share in unremunerative cereals.

The tenant farmer now, in many instances, knowing that wheat raising is not paying, is neglecting the proper tillage of the soil, and is naturally devoting his attention to such branches of farming that are more remunerative; and especially does he devote much time to products of which he receives all. His garden and potato patch is heavily manured and thoroughly cultivated, while much time that should be given to cultivating the wheat ground is given to the care of his cows, poultry and other stock, and thus the landlord's share is made to grow beautifully less. In one case where a landlord had given his tenant an acre of ground for his absolute use as a kitchen and truck garden, the tenant hauled nearly all the manure made on the farm on this one plot, and devoted nearly all his time in cultivating it, to the great neglect of the balance of the farm.

Great efforts are being put forth in Pennsylvania to educate the farmers and disseminate useful information among them, and in every way to advance their interests. Efforts are put forth to induce the farmers to adjust themselves to the new order of affairs and the greatly changed conditions of their calling. But my experience in farmers' institute work teaches me that the tenant farmer is not being reached. Our audiences and those taking part and asking questions are the land owners, and but few, if any, tenant farmers are found seeking information in such meetings. Thus we are educating the landlord away ahead of the tenant, in improved methods and advanced ideas, and thus we are creating increased discord; for the progressive land owner desires to put into practice what he has learned, while the uninformed tenant vigorously opposes it.

If landlords would have harmony in this particular, they must strive to have their tenants educated up to progressive farming. Pasturing the land is one of the most expensive practices, and yet tenants hold tenaciously to this system, handed down to them by their forefathers when land was cheap and the forests afforded succulent grasses and shade and protection to droves of stock. But now conditions are changed, the forests are gone, waste lands are taken up, hay is a paying product, and we must utilize to the very best advantage all our resources by soiling our cattle. Instead of keeping one cow for each five acres, we must keep five cows for each acre.

Many tenants will even insist on pasturing their hogs, when they know that no weight will be gained in this way; in fact, hogs can scarcely find a living in the fields until outraged nature comes along to their rescue and grows a snout half as long as your arm and as keen as a chilled plow; and armed with this weapon and inspired by hunger and the devil, they do not rush over a precipice and perish as they ought to do, but go down over the farm, leaving destruction and wreck in their path.

We have an illustration given in the Bible where certain sharp practices on the part of the landlord begat like treatment from the tenant in return. Jacob made a contract with Laban to farm for seven years, not "for the half," but for a "better half," and in good faith and full of hope, Jacob entered on his duties that were to win for him the young and beautiful Rachel. When Jacob had fulfilled the contract and demanded his own, Landlord Laban defrauded him by palming off Leah on him, and cruelly outraged every honest feeling and every line of the article of agreement. But, "like begets like," and Jacob watched his chance to get even with the old man, and that chance came when Jacob put spotted sticks in the cows' troughs and thus beat Laban out of nearly all his young cattle.

But how shall we bring about more harmonious and profitable relations between landlord and tenant on Pennsylvania farms?

First. Get the tenant farmers out of the old ruts, stop building fences and have him soil his cattle, so that he can realize more on his stock and raise more hay for sale. Get the tenant to attend farmers' institutes and be a thinker along with the landlord, so as to stay in line with the advancement of the times.

Second. Stop raising wheat, and raise and divide with the landlord something in its stead that pays, and let tenants show their appreciation of the premises and improvements by caring for them, and seeing that they are not neglected and abused.

Third. Let landlords remember the golden rule and "Do unto others as they would be done by," and not follow the more modern rule of "Do up your neighbor before he does you." And let both landlord and tenant recognize the rights of each, fulfill all contracts faithfully and promptly, and make no agreements the terms of which will make you dishonest; and last, but not least, do not forget to "Live and let Live."

SANITARY INFLUENCE OF FORESTS.

BY DR. J. P. EDGE, *Member from Chester, Downingtown, Pa.*

The title given above is too large for an essay, and is broader than my purpose, which is more especially to direct attention to the wisdom of selecting certain classes of trees and vines as well as annual plants, for the purpose of local sanitation, in the interest of the promotion of health in families and communities.

That our forests areas do have a beneficial effect on the atmosphere is not now put in question, by any one of ordinary intelligence.

Says a gifted author on forestry, "The climatic and terrestrial influence of forest growth, it is quite clear, exert a potent influence on the salubrity and healthfulness of a locality." Of this there are evidences almost without limit. The onward march of the deadly cholera contagion even, has been effectually checked by forest ranges. They also have great influence on the extremes of temperature. We all have enjoyment in the cool of the woods in summer's heated terms, and know of the restoring effect of the sylvan camp life in bringing back to us energy and health.

We know, too, how the rigors of winter are tempered by the adjacent woodland, through their influence on the humidity and equability of the air currents. The same influences are operative during the heat of summer as well.

Who does not with delight, drink in the leafy odors of the woods, or enjoy the fragrance of the orchard? Herein lies a good deal of the health-giving influence of the shade land. We drink in more freely of the balmy air, and thereby take in the ozone that has been developed by the balsamic emanations from the leaf surface and the flowers.

This ozone has the valuable property of oxidizing the atmosphere, and a fresh, pure air coming from the woodland will always be found to contain this vitalizing element, usually not found in the confined air of ill ventilated houses or rooms. The elaborate experiments of Dr. J. M. Arders and others, have put beyond question the fact that the odorous plants, especially those giving off pleasant odors, are active ozone producers. The pine family, the hemlocks, and all the terebinths, in a very marked degree have this quality. And it is possessed by many of the house plants that give so much pleasure to the cultivated taste of our women, in their window gardening and outside floralculture. Careful observations has shown, therefore, that the fragrant or odorous emanation from vegetable growth, stand in close relation to the ozone producing function. This gains confirmation by the fact that the volatile oils and perfumes obtained from plants have the power, when liberated, of producing ozone by their action on the atmospheric oxygen. Many of these essential oils develop it in great abundance, and through this means exert a burifying and healthful influence on the air we breathe. This is sufficient evidence of the sanitary influence of the forests. They have, in various other ways, a sanitary effect by their decided influence on the air currents; on the aeration and absorption of the humidity of the air; on the rain areas, and in other ways that influence more or less sanitation, by dispelling or neutralizing those disease germs that are known to be the prolific cause of that class of diseases known as zymodic.

These material causes of disease are living germs, and are propagated as are the ferments of yeast, through cell formations. Now it is well known by scientists that these germs cannot thrive in an atmosphere well charged with ozone, and it follows that where there is an abundance of vegetation having the property of giving off freely of these aromatic or balsamic aromas, zymodic diseases cannot flourish. The resinous down thrown off by many trees and plants has the property of seizing on the disease spores, insensibly to us, floating through the air, and destroying them, it is asserted, somewhat after the manner of insect eating plants.

What, therefore, is the inference we draw from the recited facts? Simply that common prudence should inspire us to study the means by and through which we can make our surroundings healthy.

There are, as I have already intimated, many varieties of trees and whole families of them, from which we can select, to place about our homes, that will be an almost sure safeguard against malarial poison, both in the atmosphere and soil. These health producing and disease preventing agents are known as febrifugal plants. The most valuable of all of them is the blue gum or Eucaliyptus. It is not suited to our latitudes, however, but there are many others that have the same quality in varying degrees. The large family of willows is of this kind. About all of the evergreens, the larch, the poplars, and among the shrubs and annuals of our lawns and gardens, the sunflower, the hemp plant, the abutilon, and all those giving off from flower or leaf, a pleasant odor, are included in the febrifugal class.

The amount of humidity that a large willow will take up from the ground is simply wonderful, and includes the miasma that may be lurking or propagating in the wet soil. Any holder of land who has a marsh or wet meadow or springlet, can, by a liberal planting of the rapid growing willow, drain and purify it. So may any householder who has a foul drain that is a constant menace to the health of his household, purify it by a liberal growth of the sunflower. There can be few subjects of more import in the domestic economy than that of local sanitation, and to secure healthy surroundings, no better agency can be used than in a proper attention to the propagation of shade and flowering trees and plants. And as it is the duty of every citizen to do his share in promoting the common good, it is at the same time the interest of each and all of us to aid in the protection and propagation of our forestry, and in so doing we will perform one of the most important duties of the citizen, and the example must in every case bear fruit.

The young man who plants trees well, can provide for himself one of the brightest joys of life in observing the development of the creation of his own planting. If he is at the same time planting well the foundations of his own character or manhood, he may never tire of watching their growth, until as he nears life's ending, he may look upon their broad and sturdy arms and heads, pointing Heavenward, still expanding and extending under the renewals of that life force that comes with each returning springtime, and the spiritual influences of the sunlight. As they deepen their roots and extend their growth, so he, by rooting the foundations of character deep and strong, is developed into a broader and nobler growth of manhood.

EDUCATION.

By S. S. Diehl, *Member from Bedford, Bedford, Pa.*

The cultivation of the mind may justly be ranked among the greatest benefits that falls to the lot of man. Cultivation or education is the same to the mind of man as the sculptor's chisel is to the block of marble. It develops all the latent excellencies, it sets forth the inherent beauties, that had otherwise lain dormant and unseen.

Education, in the first place, adorns and beautifies the mind of individuals; it fits them for stations of usefulness on the earth in their transactions with their fellow men; it gives scope to the power of thought, imparts energy to the mind, and spreads beams of light over it; exalts man in the scale of existence, spreads before you the map of this wide world. And tell me where the benefactors of this race have lived; has it been in the dark recesses of the forest and under the conditions of savage life? Or, has it been in the temple of science, the seats of learning, and the abodes of refinement?

Who, permit me to ask, have a hand in justice and equal rights, and the foundation of civil government? Who have conducted with benignity and success to the destructive operations of war? Who have reared the standard of the church, and carried to the pestilential morasses of India and the burning sands of Africa, the consolation of pardon and salvation? If you answer as you ought to answer, you will say, the educated. But if it were not for the cultivation of our faculties of thought and our power of reason, we as a nation, would sink this day in the same vortex of degradation that characterizes the Arab of the desert, or the Hottentot in his hut. But when we speak of education, we would not wish to infer for a moment, that we lay all the stress of the word on scientific attainments. To cultivate the mind, that is to store it with all the knowledge of which man is capable of imparting, apart from a moral culture, would resemble the cultivation of a field, that it might bring forth weeds of the strongest growth.

We said that education exalts man in the scale of existence. Let me turn your attention to the fact for a moment. Contemplate a Cicero; see to what a height he was exalted in his day; see his name handed down to the present generation; see his words preserved as standards of literature; and yet he lived in time of midnight darkness, compared with the present time. We might refer you to equally as illustrious examples among the ancients. Revert for a moment to historians, philosophers and sages, and inquire whence they derived their fame. Again, a Franklin, at one stage of his life, the poor, obscure printer boy; view him in another stage of his existence, consulting with the wise and learned of other nations. He has become a mighty man, not indeed with the sword or the spear; not in the tented field; his voice is not heard among contending armies, although he may justly be styled one of the pillars of our independence. No; he is heard in the council of France; his mighty talents are able to make an impression upon the mind of a monarch and procure help for the suffering. We see him again playing with the forked lightning of Heaven; we behold him extracting this element from the clouds and enclosing it in a vial. Can you for a moment view these facts and say that education does not exalt man in the scale of existence?

Education is a subject, which, in this country, is considered one of moment and importance. When we behold the colleges, the seminaries and the vast number of schools which have been spread over the length and breadth of our land, we cannot hesitate for a moment in saying that it is a subject of moment and importance. It is a subject that has been looked to and pursued since the creation of the world. We see men in all ages, from the creation down to the present time, searching and self-denying themselves in order to obtain that which will fit them for all business in life, and fit them for being more useful to their fellow men and their country, and to the furtherance and propagation of Christianity. Education ever was and ever will be considered one of the most momentous employments of the human race. We, as Americans, ought to view it as one of the greatest blessings ever conferred upon us; namely, that we are born and brought up in a land of liberty and civilization, where we enjoy all the liberties of cultivating and improving our minds. We ought to appreciate this privilege and lay hold of every means in our power to aid us in this grand design. The mind of man is a faculty that can be ameliorated by no other means than by training, and we, as inhabitants of this grand republic, ought to apply ourselves and by that means fit ourselves for performing our duties as citizens; for there is no person without mental discipline who can support the liberty and good of our country; for education truly is the life of liberty. We boldly aver, that the moral and intellectual culture of the mind are the bulwarks of civil and religious liberty. Take, for instance, the case of a nation sunk in ignorance, and you see them bowing to the nod of a tyrant; you see then shackled in bondage, and it is only in proportion to the darkness and lack of mental culture that the conscience of a man can be fettered; for when the lights of science, truth and reason breaks in upon the soul, it must and will inevitably burst the chains of superstition, cast off the shackles of tyranny and assert its independence. We have turned your attention to the conditions of a nation sunk in ignorance where the despot bears unlimited sway. Turn your attention, for a moment, to our own happy land, and ask yourselves this question: What made it so? The answer is, education. Our forefathers who planted the tree in this western hemisphere, and watered it with their blood, had learned that they were created for nobler purposes than bowing to the mandates of a temporal sovereign; than yielding their liberty, their rights and the privileges granted to them by the Creator and preserver of the universe. Again, why are we not a nation of idolaters? Why are we not bowing down to sticks and stones? Why have we not the ponderous wheel of judgment rolling through our land and crushing its devoted victim? Why have we not all the gross idolatry and superstition in our land that characterizes heathen lands? The question is easy to answer. We have the fruition of all those means which are indispensable to the intellectual and moral culture of the human mind. We have the word of eternal life.

SANITATION ON THE FARM.

BY J. J. THOMAS, *Member from Cambria, Carrolltown, Pa.*

By way of preface to this paper, I will explain that I have not attempted to write an essay, as that term applies to the carefully prepared papers that we are accustomed to hear read by the members of this Board. It is only a brief and plain talk on the subject of preserving and restoring health on the farm. A subject the importance of which will be acknowledged by all, notwithstanding the fact, that it does not receive the attention and consideration that its importance demands. In writing on this matter, I address myself, with your permission, to the young men of this audience, particularly, those who have cast their lot with the tillers of the soil and propose to make farming the business of their lives; and as an apology, to those who will be compelled to listen to me with little profit or interest, I will plead the force of habit acquired by an experience of thirty-six years in the school room in talking to boys.

Young men with robust health and vigorous constitutions do not, or cannot realize how easily and quickly these inestimable blessings may be forfeited. I say forfeited, for in most cases the loss of health is attributed to some violations of nature's laws. It is an unpleasant commentary upon our advanced civilization that these laws are not better understood and practiced, especially when we consider the momentous importance to ourselves, our families and our country of a sound mind and healthy body. We must wonder—when we take time to consider the matter—at the little interest we take in the preservation of the health of ourselves and families, as all other matters of economy receive close and careful attention.

We are constantly devising means to improve the condition of our lands. We watch with zealous interest every indication of increased fertility or deterioration, in our field and meadow. We study to discover just what elements of fertility they are in need of, and we hasten to supply them. We use lime, phosphates and manures of all kinds; we draw largely upon chemical science, in making our diagnosis and supply the needed medicine, (so to speak); all this to keep our lands in a healthy condition. We are careful not to overtax or neglect them; in fact, we watch over them with the zealous care that a physician bestows upon his patients, for we know that if we are to prosper on the farm, all this solicitude is absolutely necessary.

The same is true in the care of our animals and machinery. In the case of the former, most farmers study and are considerably advanced in veterinary science and practice, which enables them to treat intelligently any disease that may manifest itself among his herds. He takes all precautions and pains to promote their health and comfort, while he will neglect or overlook this important matter in the case of himself and family. I am convinced that if we would bestow the same care upon ourselves, that the average life of the farmer would be increased very materially and his enjoyment of life greatly enhanced.

I have long thought that the matter of preserving and restoring health, when impaired, should be one of the principal branches of common school education. Our excellent system of schools was established, and I am proud to say, now almost supported by the State, this for its own preservation and prosperity; a most excellent and wise economy, all will agree. The laws enacted for its government amply secures the moral and intellectual training of our children. They require the study of all the branches of learning necessary to enable the student to enter upon and succeed in the many and varied avocations of life. When he graduates, he is versed in the mysteries of matematics, accounts, physiology, a knowledge of the history and geography of the world and the universe in general, all this on account of its importance to the State and the citizen. Now, I would ask, "why is it that the momentous importance has been overlooked of incorporating in the schedule of school studies, plain, comprehensive training in sanitation and hygiene?" "What can be more far-reaching in its influence upon the destiny of a nation? Compare an army of hardy, stalwart soldiers with one of puny dyspeptics. But it is not as soldiers that the graduates of our schools are of the greatest value to the community. It is their capacity for sustaining continued hard work in the various fields of labor that gauges their value as citizens of this great country of hard workers. Instead of our schools promoting these results, I am afraid the reverse can be charged to them on account of the imperfect and faulty heating and ventilating, construction of the buildings, along with the want of intelligent care of the pupils on the part of those in immediate charge of the schoods. It is true we have so-called hygiene taught, but so far as practical results are concerned, it is of little value, in fact, our text books have but one subject, the deleterious effect of alcohol and tobacco, good enough so far as it goes, but it does not go far enough. They should teach us how to prevent or treat a cold, fevers and the many diseases common to life on the farm. They should teach us how and what to eat and drink, how to dress, cook our victuals, make our beds, sit, stand and walk. How to take care of our eyes, ears and our teeth, how to stop bleeding from a vein or artery, how to resuscitate in case of drowning, suffocation, sunstroke or fainting; how to treat snake bites, frost-bites, stings of insects. We should be made familiar with antidotes for the various kinds of poison. How to act in the case of emergencies and accidents, promptly and intelligently. What suffering, loss of life, time and money would be avoided, if one-half the time was given to this subject that is wasted on learning the populations of cities in Asia, the location of nameless streams in Africa, and other geographical work that is only learned to be of no value to us?

I have no doubt our educators will recognize the necessity and advantage of such a course of study in our schools and colleges, and will secure its adoption. We, farmers, of all the people, would be benefited mostly by this knowledge, on account of our isolated situations, making it impossible to promptly receive medical aid; also, on account of the unavoidable hardships and exposures incident to our vocation. In the meantime, we should endeavor to acquire by all means within our reach, as much of this knowledge as possible.

Books on these subjects can be procured. The alliance, the grange and other associations of farmers can easily add them to their libraries. We have in every community medical men who would be willing to attend our meetings and institutes to deliver familiar lectures, if they were invited. In this way we would create an interest in the matter, and the knowledge thus acquired would soon prove its value, and popular demand for its easy acquirement and more general dissemination would follow.

DRAINING FOR PROFIT.

By A. C. SISSON, *Member from Lackawanna, La Plume, Pa.*

The draining of land for agricultural purposes has been practiced for many years. The ancient Romans found it necessary, and were the first to use pipes made of earthenware for conveying away the superficial water from their lands. In England, public attention was directed to the injurious effects of the surplus water retained in cultivated lands by a treatise on this subject, in 1652, by Captain Walter Blythe. He discovered that the "Cold, sperving moyst water" (as he called it), was the source of the rush, flag and wild grasses; he adopted drains from three to four feet deep filled with stones or brush, and covered with sods. This kind of drain was used for nearly two hundred years.

The invention of a machine for the rapid and cheap manufacture of tile, by the Marquis of Tweesdale, about one hundred years ago, marked a new era in agriculture, and thousands of acres of land hitherto of little value, were in a short time reclaimed by the new system of draining, and proved to be the most productive and valuable of any land under cultivation. The importance of a thorough system of drainage cannot be over-estimated, but the great question to be decided by many farmers is, "How can we spare the money, under the present depressed condition of agriculture, to bring about this much needed improvement?" I do not suppose that it is possible for us to drain all our land in one year, or five years; but we can commence, and by doing a little every year, we will soon find that it pays, and then we will work faster. I am satisfied that there are many farms in Pennsylvania that would be much more profitable and yield greater returns for the laboremployed, if the owners would sell out half of their land, and invest the money in tile drainage on the other half. I would advise every farmer to commence at once and drain one field, or the wettest part of several fields, and carefully note the result.

Twenty-five years ago I commenced draining my farm. I hired a practical ditcher, right from the Emerald Isle. I thought I would go slow. I let a job of 200 rods for a trial, and soon found that I had much to learn. I made many very expensive mistakes, but the results were, nevertheless, encouraging. I had the satisfaction of seeing land heretofore comparatively worthless, producing the best crops on the farm. My first mistake was in trying to make drains with the stones that were in great abundance all over our cultivated fields. I thought if I could utilize these stones in making them answer this purpose, and at the same time, get them out of the way, my success in farming was assured; but I soon found that it was absolutely impossible to make a good, substantial drain with stones, so long as our land was infested with moles. They were constantly burrowing down into my drains, leaving their holes so that during heavy showers, the soil was carried down, filling up entirely the expensive conduits that I had made, causing a dead loss of all my labor and expense. My next experiment was with tile, with perfectly satisfactory results. When they are skillfully laid, I consider them permanent. I have no doubt they will last a life-time without repairs.

I will describe our method of making tile drains: First, find the lowest point for the outlet of the main drain; if it is to run through a valley, keep it at the lowest point, always following as straight a line as possible. There should be a fall of eight inches in 100 feet in these mains. The laterals, or cross drains, should run down a line with the steepest descent, and should be of a uniform grade, when possible; but if it becomes necessary to change the grade to one not so steep, put in a silt basin at that point; for if any soil should get into the tile, it is sure to collect there. These silt basins are made by digging a pit or well, about two feet deeper than the drain, and stone it up within eighteen inches of the top of the ground, leaving it about 18 inches in diameter, inside measure. The water from the tile is discharged into these little wells and the silt or soil will settle to the bottom and can be removed as occasion requires; they are very useful in examining the drains to see if they are working properly; the out-let from these wells should be two or three inches lower than the inlet. They should be covered with a flat stone and filled to the surface and the spot marked, so that they can be readily found. There should always be a fall of five or six inches to the one hundred feet in the lateral or cross-drains. The distance apart of these laterals and the depth of same, will depend largely upon the kind of subsoil that underlies your field. If it is a tenacious hard-pan, like that found in many parts of Pennsylvania, they should be nearer together and not so deep as on a more porous sub-soil. As a rule, the deeper the drains, the less number will be required. On our hard-pan land, the mains should be three feet deep, and the laterals two and one-half, and from twenty to forty feet apart, according to circumstances; if the land is springy, they will need to be nearer than when the ordinary rainfall only is to be provided for.

Many fields are so situated that a portion of the same will be very wet, while the balance is comparatively dry, and it is often the case that a single drain will be all that is necessary to dispose of the surplus water in that field. These wet places often makes it necessary to delay several days in the spring, the preparation for a crop, or these wet spots must be worked when entirely unfit, or not worked at all; in either case, a serious loss is the result, but when these places are properly drained, they frequently become the most fertile of any part of that field. The increase in the first crop has been known to pay three times the actual cost of the improvements.

In digging the ditch, we usually plow two furrows, turning the soil in opposite directions, using two horses and a strong plow. After this, we follow with a single horse and a No. 2 chilled plow, turning two furrows towards the centre. This soil is shoveled out, after which the single horse plowing is repeated and continued until the required depth is nearly reached, when the pick and shovel will soon complete the job. Care must be exercised that the bottom of the ditch may be of uniform grade, and no "ups and downs" in the tile draining. In laying tile, a U shaped grubhoe is necessary, that a concave grove may be made in the bottom of the ditch, so that the tile will not roll, or get out of place.

We have practiced three methods in covering the joints: First, with collars, about three inches long, large enough to receive the ends of the tile and completely cover the joints; second, using cement mortar, covering the joints on top and about half way down on each side. This answers an excellent purpose, holding the tile firmly in place, and prevents soil from getting into drains, and is many times cheaper than collars; third, cover with small stones, placing carefully so as to prevent soil from entering the joints; either way is effectual, if well done. A straight-edge or spirit level is necessary to preserve a uniform grade. Fasten a block on the underside of level, of proper thickness, to show the pitch desired.

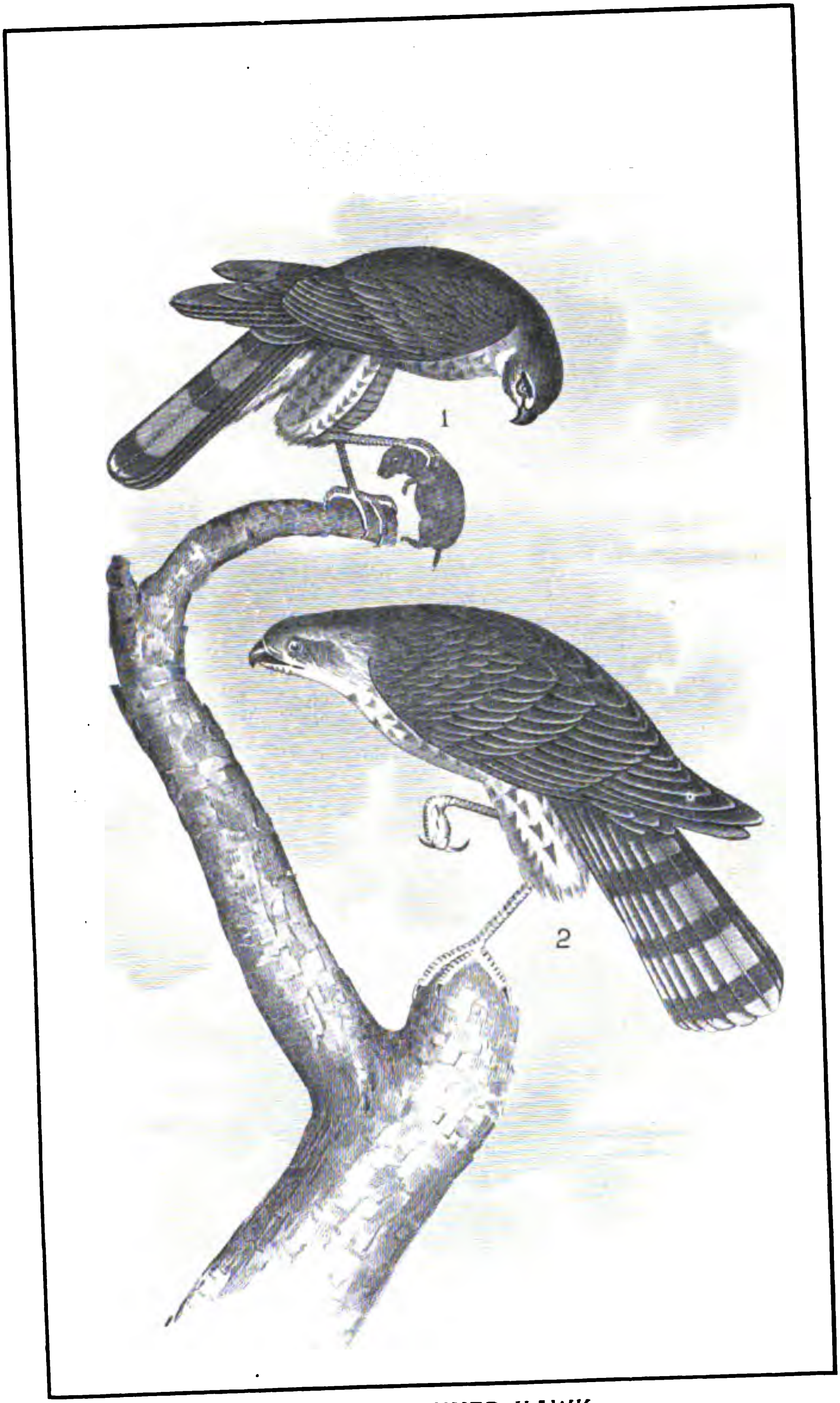
It is of the utmost importance that the outlet of drains be regularly attended to, that there may be a free discharge of water with no obstruction, whatever. Grass and weeds will often choke a drain, and soon render it worthless. The roots of trees will sometimes find a drain, enter at the joints and fill it, thus entirely destroying its usefulness.

Some of the effects of tile drainage: First the temperature of drained land is very perceptibly increased. Experiments have shown from seven to ten degrees difference in favor of drained land; second, work can be commenced much sooner in the spring, thus lengthening our seasons, often from one to two weeks. Many farmers have greatly injured their land, by plowing and harrowing while too wet; the damage sometimes amounts to more than the crop was worth; on drained land, this can be avoided to a great extent. Third, water passing rapidly through the soil to the drains below, always leaves it loose and porous, and in the best possible condition for growing crops; but, on the other hand, if it is left to be rapidly evaporated by the sun and wind, the temperature is greatly reduced and the soil becomes hard and lumpy; a poor, unpaying crop is the result. Fourth, land thoroughly under-drained will stand a long continued drouth much better than land not drained. In drained soil the air penetrates much deeper, and moisture is rapidly condensed from the atmosphere: but on undrained land, it bakes so hard that there is no circulation of air and very little or no moisture condensed. The light rains and dews are of little benefit. The roots of plants go very much deeper on drained land, and are thus enabled to reach moisture and plant-food that would otherwise be lost. Drains also prevent to a great degree, the forming of a hard crust on the surface after each heavy rain.

Small tiles are much cheaper than large ones, and are, as a rule, just as effectual. I care not if they are flushed for a few hours after a heavy rain. They are thoroughly washed out and will, in a short time, be able to carry all that is necessary. Two inches for main drains and one and one-half inches for laterals are sufficient for most land where there are no springs. In very long drains, it may be necessary to put in larger tiles a part of the way, that is at the lower end of the drains. Every man must use his own judgment, as he will know best the amount of water to be conveyed. The cost of tile will vary slightly in different localities, but as farmers begin to use them, it will stimulate their manufacture and tile machines will be introduced wherever there is a demand for tile. The cost will also be greatly reduced, as suitable material can be found in almost any part of this State.

While we consider tile draining the safest, best and most durable method, yet, very wet, swampy land may be effectually drained by laying an angle-shaped box, made of three boards, one three inch, one four inch and one five inches wide, nailed securely together, in any convenient length. The joints at the ends should be covered with flat stones; small notches can be cut in the edge of one board to let in the water, once in two or three feet, but, usually, it will readily find a way at the ends, and the joints will hardly be water tight when nailed together in the rough. If these boxes are covered with hot coal tar, they will last a long time, perhaps forty to fifty years, and in very wet land, much longer. The out-let of all drains must be protected by using wire screens to prevent mice, snakes or anything else from entering, thus preventing the free current and discharge of all water collected. The inlet at the upper end should also be closed with a flat stone for a similar purpose. In filling drains after the tile is laid, care should be exercised in tamping fine, mellow soil around them firmly, avoiding stones, hard lump sods, etc., for the first two or three inches, after which they can be filled with a plow, road machine or in any way that seems best.

The immediate effect of draining is often disappointing or misleading. The utility of drains will steadily increase for several years and their influence will extend farther and farther with age. They have a tendency to disintegrate the hard and unyielding sub-soil, and gradually unlock the total amount of insoluble plant-food therein contained, making it available for growing crops. I know of no other department of farm improvement that promises greater results for the out-lay, in these times of general depression, than a wise system of draining. From henceforth we must raise better crops and raise them cheaper, if we shall successfully compete with the cheap labor of the whole world.



SHARP SHINNED HAWK.
Accipiter fuscus.
1 MALE, 2 FEMALE.

FEEDING OF FRUIT TREES.

BY FREDERICK JAEKEL, *Member from Blair, Hollidaysburg, Pa.*

Every organic being, which grows, and which before it goes to decay or dies, endeavors to produce specimens of its own kind, must have matter of some kind at hand, to take up, or feed upon, to fulfill its mission and perform its proper functions.

All animal-life, without exceptions, either directly or indirectly subsist or feed upon plants; and the great work of plants is, to manufacture inorganic matter, into organic matter. That is, plants draw their nourishment from the soil and air; matters on which no being belonging to the animal kingdom for any length of time could subsist. The functions of plants are therefore, to convert these elements, taken from the soil and air into food for animals.

At the first glance, it seems like folly, to advocate the feeding of fruit trees, when all over this continent thousands of square miles are grown over with the finest kind of forest trees, which never had any addition to their rations of food, artificially supplied. And yet no observing farmers will deny that fruit trees, rationally manured, are doing better, and are more renumerative than if they never received any.

Generally, forest trees grow in dense masses, shading the soil on which they grow, by their leaves and branches, and keep it moist and refreshing. The leaves and dry branches, which annually drop off, remain directly under the tree; these in course of time decay, and in this form enrich the soil, with elements which the tree needs to subsist upon, and also to grow. Not so with a fruit tree; it mostly grows in gardens or orchards, unprotected by other trees, from the hot rays of the sun in summer and the cold blasts in winter. The ground is generally bare of decaying matter, and moisture keeping vegetation.

Only too often, attempts are made to grow farm crops of some kind in an orchard; leaves and other litter, which might decay under it, are carried off and the tree is robbed of that nourishment, which nature provided for it. The soil under the tree, if not cropped, and not being mulched, becomes hard; the moisture brought to it, by dew rain or snow, has no chance to penetrate the soil, but is quickly evaporated or drained off, without giving the tree any benefit, whatever. Again, a fruit tree is to a certain extent the product of culture and science. Not only do we expect that it grows like a tree in the forest, produce roots, branches and leaves, but we also expect that it bear every year a large quantity of luscious fruit.

The bearing of fruit changes the condition between a fruit tree and a forest tree; off a fruit tree, we gather and carry away almost every year, a large quantity of fruit, which is wholly composed of soil and air, which elements the tree has absorbed during the season, worked into proper matter, and stored away to subsist upon in the future. By a continued reduction of elements, which the tree has gathered from the soil, and stored away in leaves and fruit, for future use, if practiced, it stands to reason that the soil is becoming poorer and the tree, not finding nourishment, must suffer for want of it. It would follow that, all the elements or nourishing matter, which in shape of fruit we take away from a tree, must be returned to the soil in some other form, so that the tree may continue to find nourishment, grow and bear fruit.

Any soil, no matter how rich naturally, must get poorer of certain elements, if for years planted with one and the same crop, provided no manure is added, which contains the elements consumed by the growing plants. Fruit trees growing for years on one and the same spot, will draw from the soil those elements, which it is in need of, to produce wood, leaves and fruit. The tree grows larger every year, and every year it produces more wood, leaves and fruit. To do that, it must have every year more and more elements to work up; it is fixed to the soil, and that soil within its reach becomes daily, more and more depleted of those elements, which nature has provided for it, which the fruit grower, carries away in shape of fruit, and which he to assist nature, must return to the soil, although it be in a different form. If this is not done, the tree cannot find elements sufficient to form buds and at the same time mature, a crop of fruit. The fruit will be dropping off before it is mature, and the result will be a small and unsalable crop; the fruit grower not only losing his profit, but frequently and especially during a long-continued drought, many of his trees, for the law of nature cannot be violated with impunity.

To supply the fruit trees with needed elements, or in other words, to give them manure, to supply the soil with fertility, is a problem which the farmer or fruit grower has to solve. The quickest and best way to solve it, and in a practical manner, would be the application of stable manure, which could be spread under the tree as far as the branches extend. The elements contained in it will be carried down into the soil by rain or snow, and will be within reach of the rootlets of the tree. The straw or litter will serve as a mulch; it will keep the soil under the tree in a moist state, and the fruit tree would grow under the same advantageous condition as a tree in the forest. But has a fruit grower sufficient quantities of stable manure to give a good coat of it to all his trees when needed? If he has not, this problem stares him in the face; he must look about for some substitutes, but before using any substitute, must answer for himself some very important questions. The first question to answer would be: What kind of elements and what quantities of it, must a fruit tree have, to grow or construct its own body? The second question: What kind of elements and what quantities of it, must a fruit tree have to bear and mature a profitable crop of fruit, and the same time be in a condition to prepare and form fruit buds for the coming years' crop? And third: What kind of elements, and what quantities is a fruit tree capable or able to extract from the soil or gather from the air?

Chemical science has taught us, that all plants, without exception, are composed of combustible, organic matter—stuff that will burn and become lost to our senses—and non-combustible or mineral matter stuff which will not burn—so-called—ashes.

All trees and vegetables, in fact, all plants consist of four simple elements, which are: Oxygen, hydrogen, carbon and nitrogen, and in order that a tree may grow or increase and bear fruit, these elements must be in existence and within reach of it. Three of these elements are always present, within reach of the tree it may obtain them without the aid of man; these are, oxygen, hydrogen and carbon. Oxygen and hydrogen are supplied by atmospheric actions, such as dew, rain or snow. Carbon, in its solid form, a mineral; in the form of gas, a deadly poison; in a diluted form it is always present in the air. The leaves of the tree absorb or inhale it, the rays of the sun, or the action of light, assist the tree to digest it, and prepare it, to serve as a nourishment for plant life. It is produced continually, in sufficient quantities, chiefly by the breathing of animals. These three elements, as long as animals exist, and dew and rain or snow is falling down upon us, will always be in sufficient quantities, necessary to sustain plant life.

Otherwise, however, it, with the supply of nitrogen, which forms the body, the skeleton or bone structure of a tree or plant, it is existing in different and varied combinations such as kali, lime, natron, magnesia, iron chlorids, sulphuric acid, potash, silica, and others. Some of these combinations are present in most any soil, and also often in sufficient quantities; if the proper proportions of these elements present, are such, that they are soluble and in a condition for the rootlets of a tree, to take hold of, and carry it into the trunk, branches and leaves, to be worked up there into wood, leaves and fruit, no artificial addition of these elements would be required to make a healthy and vigorous growth.

The most important, and frequently the most wanted elements in our soils, are, phosphoric acid, potash, kali and lime. A light, sandy soil is generally deficient of them while a heavy soil may frequently contain lime in .different combinations amply sufficient for plants to feed upon.

Soils consisting of decomposed granite, basalt trachyt porphyry or gneiss contain always plenty of lime; it is, however, for want of other elements, or insufficient access of atmospheric actions, not soluble, and for that reason not in a fit condition to be used as plant food, although atmospheric actions are incessantly at work to cause decompositions and form other and different elements calculated to serve as plant food.

A striking example we have in our lime-stone ridges, which, by being limed, attain a high state of fertility and yield good crops of cereals, clover and corn, while, if we would lime a light, sandy soil, the labor bestowed upon it would be lost; the lime would find nothing to act upon and would be of no value, whatever.

Nitrogen in its different forms, will penetrate the soil by the aid of snow and rain, by the aid of micro-organism, present in all leguminous or clover-like plants. These have at the end of their roots a little sack or bulblet, in which they store nitrogeneous matter, which the plant for its own nourishment has gathered from the atmosphere; and which, if the plant by the actions of the plow or cultivator is destroyed, while in a growing state, becomes imbedded in the soil, and is in a proper condition to be used by other plants for food. As it would be dangerous to frequently plow an orchard while in a growing condition for the purpose of destroying the clover and allowing the trees to feed upon the surplus nitrogen gathered and stored up, by it, we must think of other means, by which we can cheaply put into the soil nitrogen, potash, kali or phosphoric acid.

When planting an orchard, it is taken for granted that the soil is in a fair state of cultivation. The holes to plant the trees should be made as large as possible, and before planting should be filled half full with bones and all other kind of rubbish which will decay; after that, the roots of the young tree should be well spread out, and carefully imbedded in good top soil. For four or five years, or until the tree comes into bearing, it will find sufficient nourishment; it grows also under the same condition as a forest tree; it produces nothing but leaves and wood, but, whenever it comes into bearing, it requires more nourishment, and those elements which are taken from it in the shape of fruit must be returned to the soil, in such a form, that the tree may be able to make use of it, in short, to feed upon.

If we consider the enormous quantities of fruit, which a healthy, vigorous tree will bear, and which, as a matter of course, is removed, we must come to the conclusion, without any scientific investigation, that something should be given to the tree in return. To loosen the soil under and around a tree, either by the use of the hoe or shallow ploughing, compels moisture to remain, and a moist soil, one saturated by water, or oxygen and hydrogen, will soon assert its beneficial influence on the growth of a tree. The air carrying with it divers elements is permitted to penetrate to the roots. No tree, however, can live for any length of time alone on air and water. Hoeing and shallow ploughing is very good, but elements which have been carried away in the shape of fruit must be returned.

We know to a nicety, the elements or ingredients of the ashes of most of our fruit. The average composition of the ashes of apples in a dry state, consist of:

1.44 per cent. pure ashes.
36.68 per cent. kali.
26.09 per cent. natron.
4.08 per cent. lime.
8.75 per cent. magnesia.
1.40 per cent. iron oxide.
18.59 per cent. phosphoric acid.
6.09 per cent. sulphuric acid.
4.32 per cent. silica.

The average composition of the ashes of pears, in a dry state, differ some from that of apples, and consist of:

1.94 per cent. pure ashes.
54.69 per cent. kali.
8.52 per cent. natron.
7.98 per cent. lime.
5.22 per cent. magnesia.
1.04 per cent. iron oxide.
15.20 per cent. phosphoric acid.
5.69 per cent. sulphuric acid.
1.49 per cent. silica.

We notice at once, that apples contain less kali and phosphoric acid than pears, but both contain a large quantity of these two elements or ingredients. These the tree has gathered from the soil, and whenever we take away the fruit, we take with it these substances, and thereby impoverish the soil to that extent. Nature, following eternal laws, will not in so short a space of time, decompose and make ready another supply for the tree to feed upon, to gain strength to ripen a crop of fruit and to form fruit buds for a crop of fruit the next year. Hence, the fruit grower must come to its assistance, and take to it the required amount of food. If that is not done, the maturing fruit on the tree, will consume all the nourishment the tree can gather. Nothing is left for the new fruit buds to form, and the result, no fruit the next year. This accounts, to some extent, for the reason that many orchards will only bear every alternate year. Of course, there are many more causes to bring about this alternate fruit bearing, but lack of nourishment is the chief of them. To remedy this unfortunate state of non-bearing, the fruit grower must feed his trees. With him, the application of the needed quantity of stable manure is out of the question. He has not got it. He cannot keep cattle enough to make it himself. To buy and haul it for two or three miles, is a very costly operation, because stable manure, as it commonly is met with, and as it will be shown further on, has not the manurial value which our grandfathers believed it had, and as a substitute for it, we are compelled to use artificial fertilizers, containing the most important substances in concentrated forms.

The intimate knowledge of the soil, upon which is to be planted an orchard, is paramount to the fruit grower. As a rule, the soil in an orchard should be like a sponge; capable of absorbing large quantities of water, without losing its capacity for proper drainage. Not often is such a piece of ground to be met with. A gently sloping hillside sometimes contains these requirements, but more often we have to put the soil in proper conditions to suit our purpose. It is well known that a heavy clay soil may be made mellow and improved by the application of fresh horse manure, while a light, sandy soil is much benefited by an application of well-rotted cow manure. The reasons for it are obvious.

To show the actual value of some different kinds of manures, without taking into consideration the mechanical actions it will have, if placed into the soil, I quote from Meyers' Agricultural Chemistry, and find that —

Horse manure contains:	*Cow manure contains:*
76 per cent. water.	82.25 per cent. water.
21 per cent. organic substances.	14.65 per cent. organic substances.
07.05 per cent nitrogen.	0.17—0.38 per cent. nitrogen.
0.35 per cent. kali.	0.06 per cent. kali.
0.32 per cent. phosphoric acid.	0.15 per cent. phosphoric acid.
3.15 per cent. total ashes.	1.9 per cent. total ashes.

Pigeon manure is the most valuable of all, and contains:

62 per cent. water.
31.32 per cent. organic substances.
1.2—1.4 per cent. nitrogen.
0.20—0.22 per cent. kali.
3.0—4.2 per cent. phosphoric acid.
6.0—7.0 per cent. total ashes.

Stable manure as hauled on the land, is, however, not all fertility; a large proportion of it is straw or other material which has been used for bedding under the animals. It must, however, be borne in mind that the straw or other material contained in the manure is of great importance; it adds greatly to the decomposition of it.

We notice, that, when the pile of manure is beginning to heat, a regular fermenting process takes place. This fermentation is the result of the formation of bacteria, by which the fertilizing substances contained in the manure are worked up into water, nitrogen or ammonia, and other substances; while much of this is lost by leakage or evaporation, yet the mineral substances left behind, are in such a fortunate soluble form, that plants can take them up readily for food. This gives the stable manure its great value, besides the mineral substances contained in it. Again, this heating process, fermentation, or the workings of bacteria, changes formed ammonia into saltpetre, and now, stable manure taken into the orchard, is perfect plant food, and if applied in sufficient quantities, there is nothing better to keep an orchard in a healthy and bearing condition. Now let us look for a minute at the question of supplying a substitute for this valuable stable manure by the use of an artificial fertilizer. The first thing a farmer or fruit grower has to consider is the purchasing expense for this substitute; secondly what kind of commercial fertilizer to use, and if used, when is the right time to apply it?

Not all commercial fertilizers at present in the market, are fit or profitable to be used in an orchard. Many of them, in proportion to substances required by fruit trees, contain too much of either sulphuric acid, saltpetre, natron or chlorites. If these substances are not in proper proportion to each other, or in proportions required for the trees to feed upon, that proportion, or the surplus of it, is lost, and the fruit grower has uselessly spent money for substances which he has no use of. Not only are these substances wasted, but some of them, especially a surplus of chlorites, if frequently applied, will work a positive injury to fruit trees; and never should a surplus of chlorites be taken to young trees, growing in nursery rows. It will destroy their usefulness altogether.

In my opinion, a concentrated fertilizer for fruit trees, either apples or pears, should contain besides other elements, at least from 14 to 20 per cent. phosphoric acid and about 50 per cent. of lime in its different compositions. Phosphoric acid, applied in that proportion to lime will not act so quick, and last longer. As we find it mostly in compositions of superphosphates, it acts too quick for our purpose. The use of superphosphates in an orchard, should, however, not be discarded. If applied to trees in a liquid state, when the fruit begins to shape itself, it will at once force a quick and vigorous growth. It can be used to great advantage in berry patches; if mixed with stable manure, so much the better. In orchards of dwarf pears on quince roots, apples on paradise or doucin stock, superphosphate can be used to great advantage, because these trees have their feeding roots very near the surface of the soil.

Space will not permit me, to discuss the different mineral substances as needed for plant food in their proper proportion, and their affinity to each other, to make them soluble, for plants can only take up mineral matter in a liquid form, if I am permitted to use this expression. But, I may add, phosphoric acid and kali, a salt, soluble in water, nearly free from other substances, will be consumed by plants almost completely; chloride, kali and sulphuric acid have to be brought in contact with lime, before they are soluble in the soil. Lime is a great absorbants of acids. If kali is wanted in soil, phosphoric acid is of no use; again, if a certain proportion of nitrogen is wanted, neither kali or phosphoric acid can be brought to action, and to a condition to be available for plant food.

In an orchard of bearing trees, a reserve or surplus of phosphoric acid, kali and lime should always be present in the soil; unleached, hard wood ashes, the most natural fertilizer for fruit trees, contains these substances in proper proportions, and if not too dear in price, as compared with other fertilizers, should be largely used in orchards, and a favorite, weak tree can be easily coaxed into a nice and thrifty growth, by frequent applications of liquid stable manure, which never should run from the stable except into the tank or barrel of every farmer who calls a tree his own.

Fruit trees, as well as other organic beings, must have an occasional change of diet; their food, as we have seen, is a veritable composition of different substances. Fruit trees which are not sufficiently fed with proper nourishment, cannot bear an annual crop of good, marketable fruit. They are weak. Sudden changes of the weather affect them much. In this starving and weak condition they become an easy prey to insects; fungus and other diseases are their constant ailment.

Vigorous, healthy trees will resist these attacks; the ravages of insects will diminish and diseases become less. They will withstand disturbing influences of the atmosphere, such as the hot rays of the sun in summer, and sudden thawing and freezing in winter. Damages to the bark caused by insects, heat or frost are healed over quicker, and besides all this, what a pleasure it is to work in an orchard filled with healthy, growing trees?

Another question, which might be asked is, how much fertilizer and of what composition should a tree receive per year? can be answered from the result of scientific investigations, which have ascertained, that an apple tree, about 15 or 20 years old, in thrifty and healthy condition, shading with its branches from 60 to 100 square feet and occupying with its roots just that much space, will produce in one year about 40 pounds of leaves, 24 pounds of wood and in the neighborhood of 300 pounds of fruit. To form or manufacture this quantity of wood, leaves and fruit, the tree would have to abstract from the soil about 300 grammes; (a gramme equal to 15,433 grains troy); of nitrogen, 200 grammes of kali and 60 grammes of phosphoric acid. This will serve as a base for the quantity of stable manure or artificial fertilizer an apple tree should receive in one year for its feed. The production of leaves, wood and fruit requires that quantity of mineral substances.

Fruit trees well supplied with nourishment will, in return and with thanks, give to the fruit grower an abundance of beautiful, luscious fruit, delightful to look upon, delicious to eat and fill his pocket with shining gold.

DELUSIONS.

BY W. H. H. RIDDLE, *Member from Butler, Butler, Pa.*

Delusions, fancied or optical, are so frequent as to be worthy of but slight notice when we are looking for the causes of our discomfort, although in either case, often quite hard to understand. It is a historical fact that the people of the Canary Islands lived long under an optical delusion, in the belief that to the Westward, on certain clear days, they could see a vast island with lofty mountains and deep valleys. So real was this apparition that its discovery became the object of several expeditions, although its pursuit was found to be the following of a phantom. Others follow delusions of fancy in their ambitions, their pleasures, their luxuries and their appetites. None of these so seriously effect the public, and particularly the great cause of agriculture, as the fancied grievances presented to the constituents of the agricultural portions of our country by the office-seeking, political demagogue.

In a country whose foundation principles are built upon the sovereignty of the individual, it is expected that the love of liberty should enshrine every heart, and that the passion for national freedom should be the noble feeling of every patriotic citizen. That these principles and this form of virtuous patriotism should be made subserve the purposes of the demagogue, in placing opportunity and power in his grasp, is no reason why it should be made the grounds of criticism against self-restraint and self-government, which are the very elements of liberty. Cursed with all the selfishness of satan, the political demagogue seeks his own enfranchisement through the perversion of principle, the distending of facts, and the violation of good faith with his fellows. He avows his principles sometimes by denouncing the benevolence of the rich, in their donations, for public purposes, whether for the indigent or for the industrious, whether it be a park in which the weary may inhale the fresh air and revel among nature's choicest gifts, her plants and flowers, trees and shrubs, or whether it be a public library, where the starved mind may be replenished and broadened; the principles of purity and freedom enlarged, or whether it be an institution of learning, endowed with professorship in all the branches of a liberal education.

Again, we find this demagogue averring his principles in the denunciation of every form of corporation at whose door he lies all the evil that betides the country, or city; if in the agricultural districts, he charges even crop failures on the faithlessness and greed of corporations. Many years ago, such men even became members of the legislature by the delusive arguments they made to farmers. They sometimes received their suffrages under promises of reducing the burden of taxes with which the husbandmen were loaded, and of compelling corporations to bear the shares of taxes which properly belongs to them, so that the tax of the farmer may be lightened. "Why should farm lands be so heavily taxed?" With this kind of argument, so full of fair promises and good resolves, legislators have been elected. Had the unsuspecting countryman who listened to the demagogues and these arguments been as careful to inform himself of the truth of these assertions as he was anxious that he should be bettered by the promised legislation, he would have convinced himself of either the dishonesty or ignorance of the man for whom he voted, and who if he got to the legislature, would not only wipe out the great grievance of tax-burdened farm lands and put a limit on corporatins which would compel them to yield to the demands or his constituency as against the rest of mankind, but in addition would pass a law compelling everybody to to buy farm produce at higher prices. Facts are stubborn things, and must convince the fair and honest minded man. This over-burdened, land tax, anti-corporation argument is the delusion I want particularly to refute. To do so, I refer to the statement of the financial condition of the State of Pennsylvania for the year 1893, as found in the report of the Auditor General. In that document, against which there can be no charge of inaccuracy, the amount of money coming into the State treasury from all sources is shown to be something over *$19,000,000.

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* The amount of $19.000,000 is not intended to mean the annual income of the State, as $5,000 000 of this sum was carried over from the preceding year.

What part of this comes from the land of the State? By an Act of the Legislature, dated February 23, 1866, section 4, farm lands are exempted from taxation for State purposes. What part of this large sum is charged to the personal property of the farmer? By an Act of the Legislature dated later, the farmer's live stock, carriages gold watches and furniture are also exempted from the payment of tax for State purposes. By an Act of Legislature dated still more recently, all persons who have money at interest must pay a four-mill tax. If the farmer is so fortunate as to be a money-lender, he is in that case one of the "All persons," and must therefore pay the four mill tax on his loans, and is burdened just that much with State tax. But the law does not compel him or any other man to be a money-lender. If the farmer has a thousand dollars in bank, the State does not ask him for any share of it; but when some person comes to him and says, "I want to buy a piece of land from my neighbor and I want one thousand dollars for two or three years," he says to him, "all right, you will have to pay in addition to the six per cent. interest, the four mill tax to the State." His necessities are such that he readily agrees to do so. The man who borrows the money scarcely ever complains; he goes into the contract with his eyes open: the lender, after taking a mortgage on the farm the man had and the piece he bought, and compelling the borrower to pay attorney fees for examination of title and recording the mortgage, does the complaining, and will vote for any fellow who will promise to relieve him of the payment of the four mill tax to the State.

The farmer is taxed by the State again when he buys land and puts his deed on record; he must pay a tax of fifty cents to the State. Then, if he dies a bachelor (having jilted a half-dozen young ladies), and leaves a nice farm, the State does impose a pretty heavy penalty for this very bad conduct. But the Commonwealth gives him his choice of single blessedness or married joys. Of this collatetral tax, no man whose estate is charged with it has ever been heard to complain after its payment. If the farmer dies, leaving direct heirs, they must pay a small State tax on the settlement of his estate, being the same whether the estate is large or small. What taxes are authorized that burden our farmers so much? School tax, to educate the children of themselves and neighbors; poor tax to support the indigent and unfortunate; road tax to mend the roads over which they must travel to enjoy life; county tax to pay the expenses of courts and county officials and the maintaining of public buildings, bridges, elections, etc. Does the State return to the counties anything? $5,-500,000 is distributed in the several counties for schools. The judges' salaries are all paid by the State; county superintendents' salaries are paid by the State, also the salaries of our legislators, while the salaries of congressmen are paid by the United States. Where does all this money come from? Farm lands and farm stock do not pay any of it. The Auditor General's report shows that it comes from the corporations of the country. The county of Butler, whose chief industry is the pursuit of agriculture, receives from the State over sixty-five thousand dollars; in addition, the normal school of the county has received from the State treasury over fifty-two thousand dollars in the way of appropriations and aid to pupils and graduates, making over $100,000 which an agricultural county gets direct from the State treasury, into which she pays the small sum of $10,775 as State tax on personal property, but nothing on her farm lands. Other counties receive the same liberal share of the State's funds. But some will say, "while your figures may be correct, taxes are very burdensome, nevertheless." I answer, "You do not need the promised legislation of the political demagogue to reduce them." No legislation for that purpose is needed. Every township can make its poor tax, its road tax, and its school tax lower if they wish to do so under the law as it exists. Every county can reduce its millage by keeping down expenses, and while it is neither wise nor prudent to make these reductions in taxes and thus lessen the burden of taxation at the expense of the rising generation, by limiting their education and opportunities, the indigent in what little comfort they do have, or to deny the public the use of fairly kept highways to travel over, it is plain that these seductive promises and delusive arguments in the mouth of every political demagogue have dissatisfied many of the farmers of the State, largely because they so readily grasp at fair promises, and because their labors prevent them from spending the required time in making examinations for themselves. And, again, the report of the financial condition of the State is not circulated among them as it should be. With wholesome sanitary laws, a revenue system to replenish the State treasury mainly from the corporations of the State, with power to regulate the municipal tax rates and levies, the seeds of dissatisfaction among farmers on the tax question, are, in the main groundless, as compared with the taxes paid by other portions of the community. I am fully cognizant of the fact that this is not a popular view of this question, but it is borne out by the proofs in the case and the premises upon which the question is presented. The same line of argument discomfits the laborer, who is thus arrayed against his employer, and the public has been warned of the mighty conflict in store for labor and capital. American citizenship is not encouraged, nor is the problem of self government strengthened by the use of these arguments. It has been well said that "The rays of Liberty's torch are the beacon lights of the world;" and under a government founded upon all that "liberty" boasts of, or that "freedom" comprehends, and where Liberty's torch welcomes to homes and citizenship people of all countries, duty compels the genuine patriot to forget self in his devotion to the institutions which guarantee to him protection of life and property, to look upon the bright side of futurity, to revel in the glories of a united country with as good a government as the world has ever seen, having its inequalities,—its seeming inconsistencies, caused more by the lack of appreciation and unfaithfulness to the generous laws passed for our protection, than any defects they contain.

At the point which civilization has reached, the cost of living in its fullest enjoyment has correspondingly increased. The expenses of the government, State and municipal, have been enhanced. The education which enabled our fore-fathers to do the work of their lives would be of little use to the progressive man of today; the roads over which they traveled would be ill-suited to the vehicles of today. Why, then, be disturbed by the predictions of the demagogues whose patriotism is measured by his desire to hold office, and to assist in making laws without reference to the community of interests in the make-up of our industries, simply to carry out delusive promises, assail corporations, and challenge their influence against every measure he presents? How would legislation be effected if our farmer legislators would accept the civilities of corporations in the spirit of thankfulness, extend to their representatives the olive branch of peace, and consider wisely the mutual relations of both, in the legislation asked for, instead of assuming that because a corporation asks legislation, they ought of necessity oppose it, and in turn receive the enmity and opposition by the defeat of measures which they ask at the hands of the very men they expect to annihilate? The inspiration which actuates the demagogue unfolds his selfishness in his endeavors to carry out his purpose; in fact, unfits him to act as a guide to civilization. His efforts impede progress and his willingness to sacrifice everything for self-aggrandizement, create distrust. At his door the unrest and troublesome bitterness against capital may be laid. It is safe to say, however, using the language of a celebrated speaker, that "under the benign influences of enlightened law-making and law abiding liberty, the problems of capital and labor, poverty and property will work themselves out satisfactorily."

THE EDUCATION OF THE FARMERS' SONS AND DAUGHTERS.

BY DR. N. C. SCHAEFFER, *Superintendent of Public Instruction, Harrisburg, Pa.*

Some one has said that the greatest problem of the nineteenth century is the boy, with one exception, namely: the girl. We shall not attempt to discuss the problem in all its length and breadth, but shall confine ourselves to that portion of it which confronts the rural districts of Pennsylvania. Nor is this part of the problem as comprehensive as many suppose. Only one-fifth of our population is engaged in agriculture; the remaining four-fifths are engaged in other occupations, and may be said to live in the larger villages, towns and cities.

In the last decade the population of Pennsylvania increased more rapidly than that of any other State in the Union, and yet, the last triennial assessment shows a decrease in the number of taxables in many rural districts. In the last century, Alexander Hamilton lamented the reluctance of our people to move to the cities. He predicted that our nation could not attain greatness until there was a change in public taste. Had he lived until the closing decade of this century, his most ardent wish in this respect would have been more than gratified.

Strong men are bred in the country; then they move to the cities to find a field for the display of their powers. The statement was recently made that all the bank presidents of New York city were country boys. When Washington Gladden addressed his famous circular to the hundred most successful business men in Springfield, Massachusetts, upwards of eighty replied to it, and sixty-nine stated that their early days had been spent in the country.

If the claim that so many of our merchant princes and other leaders in the city were once country lads, is founded in fact, there must be something in the tranquil conditions of country life that is conducive to the development of brains, and vigor, and strength of character. Civilization reminds one very much of the fable of Antaeus. When Hercules wrestled with this giant athlete, he found that Antaeus regained his strength as often as he touched his mother earth. But when Hercules succeeded in lifting him up and sundering his contact with the soil, he soon conquered him. History teaches that agriculture lies at the basis of national prosperity; that races go to ruin when their contact with the soil is destroyed. With the decay of agriculture, in the states of Greece and Rome, and the growth of cities, the political habits and social purity of the masses underwent a decided change for the worse. With justifiable alarm, it has been pointed out that according to the last census, one-fourth of the entire population in the United States dwells in large towns and cities, and that in many places the most progressive part of the rural classes have moved to the large industrial centres. In Pennsylvania the tendency toward the larger centres of population seems to have been intensified to a degree equal to that of Netherlands, where four-fifths of the population dwell in towns of over 2000 inhabitants.

It would be difficult to enumerate the many forces which have conspired to produce this effect, but no doubt a partial though by no means adequate explanation is to be found in the kind of education which has been given in our rural schools. The instruction hitherto given has created altogether false ideals of success, and false notions of the relative advantages of country and city life. The city is held up as possessing advantages and comforts and chances of preferment which the country does not possess. The few who go from the country to the city and there achieve eminence and success, are held up to the admiring gaze of the country lad, for the purpose of stimulating his ambition and his zeal in study; the thousands who fail and who eke out a scanty subsistence, living from hand to mouth, are never heard of until a financial and industrial crisis robs them of employment and throws them and their families upon the charity of the public. Ninety-five per cent. of those who start in business are said to fail; rural life shows no such percentage of failures. When the price of wheat and meat is low, the farmer may not realize much on his products; but he and his wife and children have something to eat.

"But," exclaims some one, "nine-tenths of our farms are mortgaged for all they are worth." A statement of this kind, if reiterated again and again, is at length accepted as true by most people, without further investigation. A writer in the "American Agriculturist" has recently examined the census of 1890, and he finds that more than seventy (70) per cent. of our American farms are fully paid for, and less than thirty (30) per cent. are mortgaged. The average mortgage represents only one-third of the value of the farm upon which it is secured. The total amount of the farm mortgages is hardly one-tenth of the whole value of all our farms. In 1880 nearly one-fifth of the mortgage indebtedness rested on farms; but in 1890 farm mortgages represented only one-seventh of the country's indebtedness on real estate. According to Geo. K. Holmes, the indications are that final figures will show that over two-thirds of our four and a half millions of farms are owned free of debt, and that all the mortgages on actual farms in the whole United States today, do not exceed the value of one year's hay crop. A wide-spread discussion of these facts at school, at the farmers' institute and in print, should cause a revulsion of public sentiment favorable to agriculture.

We do not have at hand the figures for Pennsylvania. Probably the statistics are not as favorable as those of other parts of the Union, for in some of our counties, farms have recently been selling for less than their assessed valuation. Nevertheless, a very careful State Senator, who has looked into the sheriff's sales of farms in Lancaster county during the past year, ventured the assertion that, with two exceptions, the failures were due to speculation in other lines of business. Listen to the proceedings of the State Board of Agriculture, and you will reach the conclusion that some of them either make big profits or tell big yarns. A practical dairyman near Harrisburg has, by the use of Babcock's test, weeded out his poor cows and substituted better ones until he has increased the average weekly production of his dairy of fifty cows one and one-quarter pounds each per week; and he further claims to have done this without the consumption of any more food. Instances can easily be cited to show that by putting brains as well as toil into the soil, some farmers get a rich return in money.

The yearly statement of one of the market gardens near Paris sounds as fabulous as the tales of the Arabian Nights. The garden was two and one-quarter acres in extent, the rental was about $175.00 per acre, 15 men were employed, and yet the profits considerably exceeded $5,000.00. Our rapidly growing centres of population will in no long time give us districts similar to the suburban regions in the vicinity of Paris. In this connection it must be borne in mind that France teaches agriculture in her public schools. The object lessons and drawing in the lowest grades relate to farm products. The rural schools have a school garden attached, in which practical lessons are given to pupils from seven to nine years of age. Older pupils receive more advanced lessons.

Teachers, as a rule are the most conservative people on the face of the earth. They seldom place a just estimate upon any thinking outside of the traditional branches of study. Is there not as much effective thought displayed in a good crop of early potatoes as in the solution of a problem in circulating decimals? Did the dairyman not show as much good thought in the management and increase of his dairy product as Hegel did in the production of his philosophy of history?

The first great test of good teaching is found in good thinking on the part of the pupils. All thinking is a process of comparison. Hence the prime condition of good thinking is clear, definite conception of the things to be compared. And this is precisely the point where many a pupil is shipwrecked. A Boston boy was asked the size of a cow. He replied, "As big as a finger nail." The country boy knows better than that. But ask him whether a cow's horns are above the ears, below the ears, behind the ears or in front of the ears, and you will find equal ignorance of things which he at least might have observed. A few judicious drawing lessons would for ever cure ignorance of that sort, by opening the pupil's eyes to the environment on the farm. Why not let the object lessons turn upon the real things with which the farmers' sons and daughters must be conversant if their toil and thought are to make farming lucrative? Why not tell the boy of great agriculturists when he studies the history of his own and other lands? He hears of Wellington and his battles, but never a word of Townsend and the Norfolk rotation of crops. He hears of Gladstone and his speeches, but never of Bakewell and his improved breeds of stocks. He reads of Roscoe Conkling and his management of political conventions, but not of the man who did more for New York than Roscoe Conkling—we refer in all seriousness to Jesse Williams, who conceived the idea of a cheese factory and built the first one at Rome, New York, in 1851. Our pupils read about the pioneers who fought and cheated the Indians, but how few have heard of the pioneers in improved methods of farming, whose services to humanity entitle their statutes to occupy conspicuous places in the temple of Fame?

If these facts are to be instilled in the minds of our framers' sons and daughters, if the secrets and principles of agriculture which are now known to a favored few, shall be made as familiar to our country boys and girls as are now the facts and principles of mathematical and physical geography, once known to but a few leading men at the great universities, then the one thing that is needed above everything else is better teachers and longer terms in our rural schools. Every sane man admits that the rudiments of knowledge, which are seldom acquired if not learned in childhood, should be taught first. Every teacher knows that the time during which some boys and girls find the schools open, is rarely sufficient to give them a taste for good literature, and to teach them the essentials of a common-school education.

Pennsylvania ranks thirteenth among her sister States in length of school term. Is she thirteenth in resources and material wealth? With the exception of West Virginia, the States bordering her on the north, south, east and west have a longer term. In violation of the plain letter of the law, the minimum term of six months is subdivided into a summer and a winter term, whereby some farm hands get but two or three months schooling each year. Is there a single southern State that does not give its colored children better school facilities than that? Does the South think more highly of its negro boys than Pennsylvania of her white children? A youth living in one of these divided-term districts can be excused for migrating into the city in the hope that even if his golden hours for study are forever gone, his posterity may enjoy school advantages equal to those which are offered south of the Mason and Dixon's line.

There are some things which the School Department can not explain. Some districts levy no school tax, whatever. One hundred and thirty-three (133) districts pay less in teachers' salaries than the State gives them for the support of the schools. Most of these districts have but a six months' term. In the long run, can this be anything but a suicidal policy for the agricultural districts? When the next Legislature meets, will the cry not come from the cities that the country districts have been receiving more money than they need, that a larger share of the appropriation should go to the cities which with increased taxes and the annual erection of new school houses, still find it impossible to provide as many seats as there are children to be educated? May not the corporations claim that they have been taxed beyond the necessities of the Commonwealth? A part of the public revenue is obtained by taxing widows' thirds and the money which guardians have loaned out for the benefit of their wards. May the widow and the orphan not justly claim a return in the shape of better schools and longer terms?

It has been said that a poor lawyer is too dear at any price. A poor teacher is too dear as a gift. Where a poor teacher is employed, the children lose golden hours and golden opportunities; their taste for study and desire for knowledge is destroyed, and the salary paid is public money wasted. But all the blame should not be cast upon the poor teacher. The State College furnishes a library on agriculture, consisting of fifteen volumes, for $18.04; but what teacher, earning from twelve to thirty dollars for six months, can afford to purchase such a library? Moreover, there are districts in Pennsylvania where the farmer taxes himself five or six hundred dollars for each son and daughter in order to procure for them, at boarding school, an education in branches which might be taught at home if the best teachers were employed, and township high schools were established and maintained. The farmer whose acres are free from debt may afford this expenditure, but the tenant who farms "on shares," is unable to send his children away to school; hence they grow up, having poor school advantages, with no knowledge of how to make farming pay; and is it any wonder that they move to the cities in quest of better schools and more lucrative employment?

The following measures and remedies deserve careful discussion and adoption, in so far as they are feasible and practicable:

1. An agitation that will create in the public mind the belief that on a farm there is nothing more valuable than the farmers' sons and daughters.
2. The purchase of a small library on agriculture, such as the State College furnishes for $18.04. This would not be half as expensive, and might be made ten-fold more useful than the expensive charts which many school boards have been led to buy.
3. The employment, in rural districts, of teachers with enough training to show the application of elementary science to agriculture and horticulture. Enough instruction might be given to awaken interest and thought in the direction of successful farming.
4. The lecturers who speak before farmers' institutes might visit the schools and show how object lessons can be given in their special line.
5. Follow the example of France in fixing a time when agriculture shall form a part of the school curriculum in country districts.
6. Ascertain whether any industries have been brought to Pennsylvania whose property is exempt from all direct and indirect taxation for school purposes, thereby obliging the farms and other real estate to pay for the schooling of the children of those employed in these industries, and if so, equalize the taxation for school purposes.
7. When schools are so small that a teacher must be hired for less than a dozen pupils, give directors the option of paying for the daily transportation of these pupils to other school houses, thus increasing the attendance at each school to a reasonable number, and making the hiring of the best teachers possible. This plan has been followed in Massachusetts with good results.

STRUCTURE OF ROADS.

BY S. R. DOWNING, *Member-at-large, Goshenville, Pa.*

Allow me to give you in a brief paper our receipt for what we esteem a "good road." Please remember, first, that the best roads cannot be built without machinery, crusher, sieve, roller, engine, etc., for the reason that fine and hard rubble and chippings, equal to clean gravel, for surfacing and binding, are essential. Cover the old pike, the stones of which have become fixed or wedged, with these chippings, and you will realize the necessity for them in making smooth roads.

The earth formation should be rounded and ledged at sides, with centre raise of 4 inches for 16-foot width road. On this foundation lay a base of 6 inch blocks by hand, wedging cavities. An even base will save metal. Roll this base from sides to centre. On the base, lay a 6 inch thickness of small, hard, uniform rubbles. This rubble is the road. The blocks are but the base of the road. Citizens of our county are now traveling over the base of the old Conestoga and Lancaster pikes. The limestone or soft superstructure has passed away. Thus many of them cry out against hard roads, saying, "we want no more pikes."

Roll the rubble after rains from sides to centre. Then cover with a slight coat of bank sand, clear of clay, and over all, distribute 1½ to 2 inches of chippings. Roll when wet, from sides to centre. Place two energetic, skillful men at the dump. One indolent, indifferent man will cost the township hundreds of dollars in a mile of road, in that, failing to spread the metal, and that too evenly, more than necessary will be required and the road will hold water.

Recrush the hard rubble; for hard stone, a strong crusher and a 16 horse-power engine are required. When surfacing the Lancaster pike from Berwyn to Philadelphia, the Lancaster Improvement Company freighted their hard metal from Bergen Hills, near Jersey City, notwithstanding the road adjoins a succession of limestone quarries.

The less taxpayers charge for hauling, the more road can be built; weighing every load at the crusher will save contention, unfairness and money. For an even or descending grade, two horses are not needed. The speediest teams should lead. The supervisor who fearlessly adhered to an economic plan is the more sure of re-election, notwithstanding selfish cries and complaints. He has the quiet, fair loving people back of him. If he scares, he is gone.

(To find the number of perches of stone required, multiply length, width and thickness of road in feet and divide by 24.75.)

The cost of a road depends upon length of haul, texture of rock, wages for teams or men.

A word, too, as to the law governing township loans for roads. Our procedure under this law was as follows: A series of meetings were held for discussion. Mr. Walsh and Mr. Biddle, of Delaware county, gave us the result of their road operations under loans. Finally, when we were sure of enough backbone to make the venture go, we called a meeting to decide as to whether our supervisors should call an election, and if so, to determine the amount of loan and designate where it should be expended.

The meeting was held and by a majority vote, the supervisors were directed to call an election. A committee of five from different sections of the township reported in favor of a $30,000.00 loan, and named where the hard road should be built. This report was adopted. Our supervisors then made affidavit to the court as to our township valuation, debt, if any, the amount of money to be loaned and its percentage of lien, and petitioned that a vote be had at the time of our township election, which the court granted. The election was then advertised by our supervisors, such advertisements containing statement of amount of loan asked, its percentage of valuation, the absence of debt, time and place of election.

At the polls, tickets were voted "For a road loan of $30,000.00," or, "Against, etc." A majority "For" prevailed. The count was returned in the ordinary way to the prothonotary. The ballots, however, were returned to the court and counted by the judges, the ballots being accompanied by affidavits of our election officers that the vote was made in conformity with the Act of Assembly governing such election. The court decreed in favor of the loan.

As soon as the decree was made, the oldest bank of Chester county, offered us par for our bonds, agreeing to allow us the principal as we wanted it, to pay off as we wanted, excepting that we should pay the entire debt in thirty years, and offering again to engrave our bonds without cost to the township. The bank is now holding these bonds, simply as a good reserve investment.

It may be that three-fourths of this audience, even five-sixths of it will say, "no mortgage for roads." If so, I am sure there need be nothing between us of ill. I have given you what I honestly believe to be truth. It would have been cowardice in me to withhold it from you, for after all, was not the Union saved by a mortgage? The mortgage is as powder; if we risk it too far it will blow us up; but rightly handled, it has laid up and cut out steel ways that are the woof and chain of inter-communion and welfare; it has gone down for precious ores and built cities. It is back of heat, light and transit; homes and churches, education, science, agriculture and civilization. As we morbidly, perhaps, tremblingly cry out against the mortgage, how can we help, kind friends, seeing all this—how can we help honestly to acknowledge the service of the mortgage?

If East Goshen had waited until taxes became uniform and all people paid for roads who should pay; if we had denied ourselves simply because we might make the bicycle boys happy, who after all that is said and may be said of them, subscribed in part a gift to us of $2,200.00; if we had thus delayed, we would have wasted more than we would have received; and as yet there has been no bill of prominence before our legislature, but what would have appropriated to East Goshen an even share with onther townships. To that, deploring our dirt road waste of hard earned dollars, knowing that increased taxes must come as well at the end as at the beginning of a few years, we chose the beginning, with all its savings, and are now vigorously setting our house in order to stop the deplorable waste that marked our road history during the past.

SOME CAUSES FOR THE DECLINE IN THE PRICES OF AGRICULTURAL PRODUCTS.

BY HON. ALBERT S. BOLLES, *Chief of the Bureau of Industrial Statistics, Harrisburg, Pa.*

The subject of agricultural taxation, on which it was proposed that I should speak, is not a very cheerful one. Some of you may have heard of a man who, when the plate was passed in a church deposited fifty cents and immediately replaced the piece with a quarter, and when asked after the service was over for an explanation of his conduct replied, that it was the result of recalling the scriptural saying, "The Lord loveth a cheerful giver." If I could have worked out any plan of lessening taxation for the farmer as easily as this donor lessened his gift, I should be happy indeed to present it to you, but as I know of no way of lightening the burden, perhaps if I say something concerning the causes for the decline in agricultural prices, it may possess more interest and prove more profitable. This, too, is not a very pleasant theme, yet it is one in which every person is deeply interested at the present time.

For years, prices have been receding, and I suppose that every person engaged in production, either as a farmer or manufacturer, is wondering when the end will come. When General Butler flourished in Massachusetts, he had a way of pleasing his immediate audience by presenting some hopeful outlook without the slightest regard to the harmony of his utterances. He would go into Berkshire county, of that State, for example, and say: "Farmers of Massachusetts, are you porsperous? I know you are not. What is the matter? You are getting a dollar a bushel for your potatoes when you ought to get $1.25." And then we would address the workingmen of Boston in this manner: "Workingmen of Boston, are you prosperous? I know you are not. What is the matter? You are paying a dollar a bushel for potatoes when you ought to buy them for fifty cents." The General had regard only for the audience he saw; a strong line of argument that would hold from day to day, or year to year, had no fascination, or even regard for him.

I am often told that one of the causes affecting the prices of agricultural productions, as well as the prices of other commodities, is the small quantity of money in circulation. If there was more, it is asserted, the farmer as well as all other classes, would thrive as they did thirty years ago. When one considers the unemployed millions in the banks, he wonders how the addition of more money could affect prices or start them into newness of life. Indeed, while the plethoric condition of money has never been so great as at the present time, yet for the last twenty-five years there has been a vast amount of circulating wealth in the country, and no one can deny this, for a low rate of interest has prevailed which is an infallible test. Those especially engaged in insurance have made a deep study of this question with reference to their funds for insurance, and have contended for a number of years that the interest rate was declining; and this is the tendency all over the world in consequence of the increase of money, as well as the use of other things as substitutes. Of course, money, by which is meant gold and silver, bank notes, etc., is only one of the agencies for effecting the exchanges of the world, and the larger ones are accomplished by the use of bank checks and other instrumentalities of commerce. The world has a vast amount of wealth or circulating medium which can be used for effecting the exchange of the world's produces; and, therefore, there is no force or truth in the argument that prices are declining in consequence of a lack of money.

But this is a different proposition from another, namely, if the quantity of circulating medium was greatly increased, prices might start, might advance. There was a time, for example, before the discovery of gold in California and Australia, when prices were shrinking constantly, just as has been the tendency for many years, that the hopes of men died and stagnation settled over the industrial world. Men then saw no light and were in quite the same condition as they are today. A steady receding was experienced everywhere, in England, France and in all the industrial countries, and men often said to each other as they do now, when will the end come, when will this cease, when will there be a revival of business? What caused a revival? It was the discovery of the gold mines of California and Australia. A vast amount of wealth was poured into the world which quickened the life of industries to the most remote parts of the earth.

We are more familiar with the experiences of the civil war. A vast amount of paper circulation was created and prosperity spread over the country as it never did before. Prices rapidly increased, factories of all kinds were built and everybody seemed to be in a highly prosperous condition. It is true it was short lived and dependent on other things to a large degree. Nevertheless· the opinion of many was that this prosperity was chiefly the result of the sudden increase of circulation. Today, remembering our former experience, they believe that if there was a vast amount of paper or other kind of money poured into the circulation, there would be a return of the old-time prosperity. This is one of the reasons advanced by many who are in favor of repealing the tax on the national bank circulation, and thus opening or preparing the way for the State bank money. In some sections especially the feeling prevails that, if our present system were changed and State banks were permitted, the quantity of money would be increased and the country would speedily feel the effect of the genral development of our industries. It may be asked, how would the increase affect them? Just as the present large increase in bank deposits must eventually quicken them. If the tax was repealed and money could be easily and cheaply manufactured, it would be loaned and new enterprises would be created in every direction. Consequently, more persons would be employed and everybody would come into the possession of more money, consumption would be increased and prosperity would return. That is the cycle that would be run if money were increased. It is thereforet rue if, by the repeal of the tax on circulation, or by extensive gold discoveries, or by any other method, the circulation was largely increased, there would be, for a time at least, a return of the old-time prosperity. But then another result would follow just as surely as that which happened after the war. If our prosperity is stimulated to an unnatural and unusual degree, then reaction must evidently come. We all know that if we walk too fast or work too hard, we get tired. And if an unusual supply of money were put in circulation, followed by immediate prosperity, a reaction would inevitably set in. Consequently, every thoughtful man has asked, is it wise to establish a policy which in the end would leave us in worse condition than we are in today?

The latest illustration is the experience of the people of the Argentine Republic. A few years ago there was great prosperity in that country; a vast amount of money was put in circulation. Enormous enterprises grew up in a night, all were filled with hope, but the more thoughtful believed that a reaction was inevitable and today all business is paralyzed. Such must be the result from the nature of things if an unnatural stimulus is taken. If we have enough money today, then any unnatural or unwise increase may result in a temporary prosperity, but must end in a disastrous collapse.

I think one of the causes that has influenced the prices of agricultural products, as well as the prices of other commodities, is the excess, not always large, of production over consumption which has existed for a good many years. During the war, profits were so great that there was an enormous increase in all the agencies of production. Perhaps the largest increase was in factories for making woolen goods, because they were so largely used for army consumption. Then in iron industries there was a large increase. In short, in every direction there was a large increase in the agencies or instrumentalities of production. The war closed, the demand fell away, and there was a larger agency for production than means or persons for consuming the products; and that state of things, although not in as large a degree as immediately after the war, has continued. In almost all the industries, whether producing agricultural products, iron, steel, or other things, there has been a considerable excess and which has yielded many consequences.

During the war when the demand was greater than the production a buyer would go into a commission store, for example, to make a purchase. The seller could be very stiff with his prices for he knew the goods were wanted. So long as that state of things lasted, of course the producer was in a prosperous condition because he commanded the situation; but now, since that condition is changed and there is a slight excess in production, the consumer is king. He goes into a store to buy goods. He knows that the seller is more anxious to sell than he is to buy, because, if the price does not suit him, he can go into some other store and get what he desires. Formerly, a buyer was afraid to go away from a store without purchasing, and he paid what was demanded. But now a buyer is confident that if the prices do not please him he can wait a few days and get what he wants. The situation, therefore, has changed and the producer is placed very largely at the mercy of the other. The consumer controls the situation and the producer must yield.

One may ask, is it possible to correct this situation? is it possible to give the producer a larger independence or control over the markets than he now possesses? This question has been considered to some extent by the farmers of our own good State with respect to their products; whether they cannot form a combination whereby they can have something to say concerning the prices they get for their butter, grain and other products. Within a few years the cotton growers of the South have been awakening to the situation. Formerly they raised cotton and sold it for whatever they could get. Within a half dozen years associations have been formed through the South for the purpose of obtaining advances and keeping their cotton until they could obtain better prices. In other words, they have sought by this means to get sufficient capital or credit to enable them to hold their cotton for a few months with the expectation of obtaining a better price than they did before by selling to the men who first came along and offered to purchase. This plan is extending through the South, and it seems feasible. The question is, how far can it be adopted? for the more generally the plan is adopted and the larger the capital and credit such associations can obtain, the greater will be their success in maintaining prices for their cotton.

Other illustrations of the same kind, though of a less pleasing character, are the new monopolies and trade combinations. Take sugar, for example, how came the sugar trust to be formed?

Before its formation the sugar industry in the United States was almost bankrupt. Those who had the largest refineries and best credit perhaps made something, but for several years if they came out square at the end of the year they regarded themselves fortunate. There were fifteen million dollars invested in refineries with practically no return, and they finally combined to extract some profit from their business. I simply give this as an illustration of how they came to be, because, they were making nothing, or but little, and in some cases running at a loss and this plan was advised for remedying the situation.

Another illustration that occurs to me is the change that has come over the fortunes of the cattle growers of the West. There was a time when cattle growing was an exceedingly profitable business. Great fortunes were made in a few years. I know a firm that is engaged in the business that send several thousand head to Chicago annually who are making hardly anything now, but as the firm began early a great fortune was amassed in the business before the evil day came. Now, no business is more hazardous. What has happened? A half dozen concerns have combined to buy all the cattle, and by thus uniting either a definite or implied agreement exists among them concerning what they will pay. The far western territory is divided among them, each buying the cattle raised in the section allotted to him, so that nearly all friction between the buyers has ceased. By so doing they have gained the key to the situation, and therefore the cattle growers are obliged to sell for what they can get. They have failed by the hundreds in the last few years, and the banks on the frontier have lost large sums borrowed by them, and which they have been unable to pay by reason of this combination on the part of the buyers of cattle. Suppose the cattle sellers could get the means or credit so that they could have something to say concerning the price of cattle, then the situation would be changed and they would be able to get a higher price for what they produced.

Another cause affecting the price of produce is the cheap lands of the west. This is a very large question and I shall merely glance at it. We understand the present policy of the Government in selling these lands to whoever wishes or desires to cultivate them. Practically, they have been given away, and what has been the result? A man goes to Dakota and takes up a valuable piece of land, which has really cost him nothing, and he has a plant or farm in which there is very little invested except his implements and the like, compared with a farm in Pennsylvania. Looking at the policy from this standpoint. one can well question the wisdom of the homestead law. True enough, it has been a blessing to those who have cultivated the great prairies and have made them blossom and productive, but how have the people in the older States fared? The prosperity of the west has been unquestionably purchased at the sacrifice, to some extent, of the farmers of the east. It has been said that the railroads might have obviated this state of things. In one sense it is true that the situation is largely controlled by them,—not wholly, but to some extent. If they had made rates high enough, of course, these would have operated as a prohibition on western products. That, I suppose, would have been pleasing to some people in the east, but, after all, the railroads, especially from Chicago, have less perfectly controlled the situation than many believe. The truth is that the railroads have practically had nothing to do in the way of determining the shipment of wheat, or the price of it, from Chicaco to the seaboard. The controlling factors are the lakes and the Erie Canal; they make the lowest rates and the railroads are compelled to follow these or carry no grain. In 1892 the Pennsylvania Railroad Company carried very little grain from Chicago to the east, because there was no profit whatever in carrying it. Grain was carried from Buffalo to New York, by the New York Central Railroad, at one and 32-100 of a cent a bushel, and money was lost on every bushel carried. The railroads therefore have but very little to say during the greater portion of the year to the grain shippers. Commodore Vanderbilt supposed he knew something about things when he was the controlling spirit in the New York Central Railroad. When the stock of his road was fifty millions, he thought he could make an immense sum by injecting forty millions of water, and so the fifty millions of stock was increased to ninety millions. I knew the man very well who prepared the new tariff, the object of which was to earn 8 per cent. net on the ninety millions of stock. But the Commodore lived long enough to find out that he knew less about the transportation business than he had supposed. The Erie railroad at that time was in the hands of a receiver, and when a railroad is in such a condition it is usually the most independent organization on earth. It is not obliged to pay anything; there are no stockholders to pay and perhaps no bondholders, and as long as enough is earned to pay engineers and conductors and a few employes it can swim. The Erie road was in this position; it had no troublesome questions about dividends, and the Commodore found that he must follow in the wake of the Erie or get no grain, and consequently instead of making 8 per cent. on his ninety millions of stock the dividends dropped until they went nearly out of sight. The lakes and the canals therefore control the situation, and the people of the State of New York say that the State can better afford to have the canal run at a positive loss than have it closed. And because the lakes and canal do dominate the railroads that run from Chicago to the east, the canal will always remain open. When Mr. Charles Francis Adams was railroad commissioner of Massachusetts, he recommended the purchase by the State of the Fitchburg line running from Troy to Boston and have a State railroad. In Massachusetts the people think they can do anything, and he thought the Commonwealth could buy it and go into the railroad business and make rates for the other lines. As many of the lines run through several States, we clearly see that a State can do nothing in controlling rates, and the only power that can buy the railroads and run them is the Government. Suppose that should be done; that we had an effective civil service, what would your farmer in Iowa demand? He would demand lower rates. On the other hand, the eastern farmer would say, they are too low now. Every section would want a less rate than every other competing section, consequently I do not see that much can ever come from such a policy.

The decline n agricultural, as well as all other prices, is due partly to a great variety of accidents which are inevitable, and which no sage or seer can always foresee or divine. One of the most impressive recent illustrations is the experience of the Maryland Steel Company. When that company was organized it could make a cheaper rail than Carnegie, or any other manufacturer. Ore could be conveyed to Sparrow's Point at less cost than to any other large steel plant. In comparing water transportation with railroad, the ore could be brought from Cuba to these works, nine hundred miles, at as small a cost as from Philadelphia to Steelton, one hundred miles. The machinery was of the most improved character for making a continous rail from an ingot. What has happened? New ore beds have been discovered in Michigan and Minnesota from which ore can be extracted by means of a steam shovel and put on a car for 65 cents a ton. The Maryland Steel Company has discovered that its enormous advantage has been more than neutralized by the discovery of this cheap ore in Michigan. This is a serious discovery that has happened to that company which no wisdom could have foreseen. This discovery is affecting the entire east to a greater or less degree, and at present there does not seem to be any way to get on a level with the iron or steel producers of the west. It is confidently predicted that the eastern iron and steel manufacturers must confine their business to this side of the Alleghenies, because those in the west with their cheap ore can effectually hold the western markets.

There is another side to this subject. If prices decline evenly all along, if there is a large decline in the prices of agricultural implements and all things which the farmer buys, from one point of view it might be supposed that the farmer is quite as well off with low prices as with high ones. But there are two or three difficulties that heavily cloud the situation. In the first place, in going from one level of prices to a lower, whether in agricultural produce or any other, the decline never occurs at the same time and therefore in the readjustment from the higher to the lower somebody is suffering from the temporary misadjustment. This is one of the difficulties that always prevails when prices are advancing, some things are affected more greatly than others. So, in the turn downward, there is always suffering because of the unequal periods at which prices decline. Each producer tries to maintain the prices of his product as long as possible, and yields only from necessity, and therefore while the decline is going on he may be obliged to pay more in proportion than he obtains from the thing sold, and so there is an inequality.

The most serious consequence of the decline is experienced by the debtor. We think that we are very rich, that we have great possessions, but we are also great debtors, because we have had unbounded confidence in our country. Think of the millions of railroad indebtedness for extensions and other improvements, because they have believed that future business warranted the expenditure. The Maryland Steel Company was founded on two ideas or beliefs, the making of cheaper rails and the general prosperity of our country. There has been this general confidence in enterprises of every kind, and the farmer has not hesitated to put a mortgage on his farm, nor the manufacturer on his mill, nor the railroad company on its property. This policy has prevailed everywhere, and now we are confronted with this vast amount of indebtedness with declining profits or earning power.

In this general decline of prices the concern that suffers the most is the largest borrower. Looking at the subject from the debtor's point of view, it is highly desirable to maintain prices. If it were not for him, if it were not for this vast indebtedness, the decline in prices would be less serious because this happens not simply to the farmer, but to everybody engaged in production. I once asked the manager of a great steel plant about the valuation of his concern, and he replied that its true value was its earning power. There are eleven of them in the State that refused to make a full report to the National Census office, because they declared that no one could tell what they were worth; that depends on their earning power. They are worth one price one year and a different price another year. Consider the great steel plant below the city. A few years ago it was regarded as one of the most profitable in the country. What is its condition to-day? Its earning power has been impaired. The farmer is not the only man who is suffering. All producers have shared in the general decline in the value of their plants and products. If this be so, we would not be so badly off if it were not for the infernal indebtedness that hangs over so many persons and corporations. That is the blackest cloud that darkens the industrial sky. If that did not exist, every one would be assured of an existence, though the accumulation of wealth would be slower than it was a few years since. Nevertheless all would be sure of earning something, but debtors may utterly fail and lose all hope of starting other enterprises.

I have nothing to suggest in the way of a remedy. Doubtless various remedies or experiments have occurred to you from time to time, but the experiment of the cotton growers may be worth considering. In other words, the thing for the farmer to do, as far as may be practicable, is to imitate the example of trusts and cotton growers; to acquire a more complete control over his product, and this must be done by forming associations of different kinds so as to hold the corn and wheat and other products and control the sale of them. This is the most hopeful thing for the farmer to attempt. In other words, utilize the experience of others with reference to their products. It is both just and practical for farmers to have their associations and through them control their products, instead of putting themselves wholly at the mercy of the consumer. Everybody is entitled to a fair price for what he produces, and a farmer ought to be no exception. By an association, or a great many associations, you can obtain a larger independence and have better control over your products. Surely, there is more hope for you by co-operation than by individual action.

CAUSES OF THE AGRICULTURAL DEPRESSION AND SOME REMEDIES.

BY GEORGE T. POWELL, *Ghent, N. Y.*

The question of agricultural depression is one which has been very prominent in our country for several years. It is a question which has been treated in our public papers, in the leading magazines and periodicals of our country, by the ablest minds and writers we have among us. It may be strange to us that in a nation like this, which is pre-eminently an agricultural nation, that a question of this character should require the attention and thought of able minds, and yet we all recognize the fact that this leading industry of ours is to-day in a condition of serious depression, and when we come to consider that a little more than one-half of the population of this country are engaged in agriculture, and that many of the leading industries of our nation are intimately connected with agriculture, we have abundant cause for considering a question so serious in its nature.

When we come to consider the causes of the agricultural depression we find the subject is one that is so intricate, one that is so far reaching that it seems in a single discussion almost hopeless to reach the causes for the present condition of things. However, I think in the short time given us we can consider a few points: First of all, our country leads the nations of the world in wealth. Where has it come from? We understand the wealth of our nation to-day, aggregating closely to seventy billion of dollars, has come largely from the soil and the labor put upon its products. We have grown up in a remarkably short time in history to be a nation, influential, powerful, and leading in its institutions of all kinds. We have built great cities. We have developed more rapidly than any country in the history of the world. When we come to consider the fact, we find that immense and populous cities have grown up everywhere in the land, that our country is dotted by thousands and tens of thousands of prosperous towns, representing the greatest number of prosperous villages in the world, and this has been possible by taking wealth from the virgin soil of the nation. I think when we come to reflect, I may say, that one of the prime reasons we are not taking out of the soil wealth so rapidly now, is because of this great growth.

I have on the wall here a map that I can point out to you one of the prime and leading causes for the agricultural depression, which you can see better than I can tell you in discussing this question. I wish to call your attention to one of the prime causes for present discouragement, and that is the fact that we have been drawing too heavily upon this rich soil, this soil that has made it possible to develop us so wonderfully in one or two centuries. It is true that after taking from the soil so continuously, and reaching the present stage of civilization, that we have surrounded ourselves with the conditions of society which we see about us, and the desire to enjoy and increase the facilities which monew furnishes. At this juncture, from the surrounding conditions of society, stronger demands grow upon us for money. This is where the depression comes upon us most severely. The fundamental fact is that our soil is not yielding up the wealth that it has in years gone by, and that is one of the chief causes of agricultural depression. What has been going on all this time while we have been building the great cities? Thousands and thousands of miles of railroads, beautiful churches, expensive school buildings, colleges and universities were built and developed. On our farms, in this State, we see them putting up large and commodious houses and beautiful barns, for which no State is more noted than Pennsylvania, and all this has been done at the expense of the soil. While the soil has been yielding wheat, oats and corn and all the products that have gone into the commerce of the world, it has been deteriorating, as we have been making heavy drafts upon it.

What have we been doing when we took out of the soil hundreds and millions of tons of wheat? For every ton we have taken from the farm to be consumed in the city or to be consumed in a foreign country, we have removed from the soil in plant food $7.09 in value in the elements that produced it. This has been going on in most sections of our country for two centuries, and it is surprising to the world that our country was so astonishingly supplied with plant food as to enable us to pursue such immense grain growing in that time. Now we will take a very great crop, indeed one of the most productive of great wealth in our country, corn, and we find that in every ton of corn produced or exported we have removed from the soil $6.31 in value of plant food, or, in other words, wealth from the soil. In oats, taking another crop, when removed from the soil, we have taken from it $8.17 value in a ton in dollars and cents. Now what has been the result in this immense export trade of ours? We have been exporting for a great many years very heavily. We have exported in a single year from our farms, in corn alone, one hundred and ten million bushels, and exported in a single season over eighty-seven million bushels of wheat. In oats, over sixteen million bushels. We have exported from our soil in oil-cake and cotton seed, two hundred and sixty thousand tons of these valuable products. This is one of the processes going on to deplete the soil of its nutrition, and as we have not repaired this continual loss, to-day we are calling for the same or increased yield, with the result that there has come upon us these depressed agricultural times, this shortage in money results which is going on and which we are suffering under. Because of the steady depletion of the soil, it has been impossible for our farms to support us as farmers in the conditions of life which we have surrounded ourselves with and in which we would like to continue.

There is another cause which has affected us very seriously, indeed, and involves more and more the improved land of the east, and that is the manner in which our public lands have been managed. There is no question of doubt that it has been a mistaken policy on the part of our government to so rapidly throw open our public land and invite emigration to our shores and take up this rich territory, many acres of which ought not to have been touched for a century to come. By the accomplishment of transportation, by the development of railroad building, we have pushed into this vast, rich territory of the west.

We have stimulated people of all nations to come and increased production so rapidly that during the last thirty years the production has been running in advance of the demand. It has been utterly impossible to keep apace in our consumptive ability through improved machinery and transportation, and we have thrown open the doors for these people to come here and take this free land of ours almost virtually as a gift. This has had the effect to depress the conditions of the east, and to affect the condition of the west in a very discouraging manner.

Another cause which has had a tendency to reduce land values and the products of the soil is the general development that has been going on in the old world. The nations of the old world have caught somewhat the spirit of our railroad building, and in India, Russia and South America, railroad building is going on similar to that in our own country. As a result, there has been less demand for the products of our soil in foreign countries. The products of American soil have been brought down to the level of our own wants, and consequently labor has become cheaper and a depression in prices follows as one result of the development of other nations. These question that farmers ask as to why farming does not pay better, will find an answer in the rapid development going on about us.

There is another question of importance which I wish to allude to, in the rapid development that is being made in other countries. I desire to give you one illustration, showing you why it is that the wheat growers of our country are in the present hopelessly depressed condition. On the 7th day of July, of the present year, I noted the shipments of wheat on ship board for Great Britain, as follows:

India, 1,300,000 bushels; Russia, 1,500,000 bushels; Austria, 3,800,000 bushels; North America, 5,700,000 bushels; South America, 9,900,000 bushels.

This was all loaded for shipment for foreign countries. In South America, the 9,900,000 were placed on ship-board at a cost of thirty-seven cents per bushel, and it was further stated that there was a profit realized upon that shipment from South America of thirty per cent. on the investment. When I saw that statement I could understand why it was that the wheat growers of Pensylvania and New York, who had been so successful in building up comfortable fortunes, in years past, why their conditions were so hopeless today. It is utterly impossible for us, living under the conditions we do, to compete with conditions like these. Here is this development going on in other parts of the world that are so different from our own, until it brings us down to the level of production and value in those countries.

Now consider the question of losses: We boast of being a great nation, as we truly are; and yet, while it is true that we have been a people of indomitable energy and will, as we push to the front let us not lose sight of the fact that the development of agriculture is carried on not only in the new territory of our West that I have mentioned, but in the older portions of the world agriculture is being studied. I have not time to give you the methods of culture in Belgium, France and England, but it may be a surprise to many of you to be assured of the fact that in point of skillful methods of agriculture, France leads them all. Upon German soil there are methods of culture of which we are wholly ignorant. One reason for the present depression is that we are coming into direct competition with these skillful producers. Now, this places us in the position of competitors. We, as farmers, stand in the same position as the business competitors of Philadelphia or New York, or the business men, with many of the populous towns of your State—they work as close and are individual competitors. We have reached that point in our development in agriculture that we are close competitors today. We compete not only in the same business, in the same markets, but we are placed in competition with all the agriculturists in the world. Hence, when we have come to be subject to the same laws of competition that business men and professional men do, it is natural that the farmer, differing from the merchant and trained professional man in the fact that he has not had professional training in his business, becomes discouraged to have to meet these closer conditions which he is not fully prepared to meet, hence the cloud of discouragement and the spirit of depression which has settled down on the farmers of the West and every other section, for the reason that they find themselves competitors with those who are studying skillful production. This is not altogether the most discouraging condition. It is obliging us as producers to adopt better methods of culture and adhere to them closer than we have done, for as we examine the methods of our culture, we discover much that is carried on in connection with our farms in a manner which would not be called good business principle. We recognize the fact that we are meeting with immense losses on our farms. I can give you a few brief figures on this point. The losses going from us by export trade in a few articles alone, runs up close to $38,000,000, in what is taken from the soil.

In 1890, we exported 103,417,928 bushels of corn, including corn meal, removing in value in plant-food from the soil, $18,261,715.66; 54,765,880 bushels wheat, including flour, removing in value, $9,808,739.23; 14,488,928 bushels oats and oat meal, $1,882,920.38; 355,352 tons oil cake, $7,611,639.84; making the loss to our soil in these exports, $37,565,015.01.

In wheat and other cereal productions on all new soils, the loss in these elements of plant food is entire, because the straw is burned and there is nothing applied from other sources to replace the loss. We let that go out of the country as a positive loss which must be made good. If we are to encourage or stimulate an export business of cereals, we have to study where our profits come in when you take from the soil nearly thirty eight millions annually, which must be made up in some way of what we ship in products.

Let me take a few figures from my State on another line. From the number of domestic animals in New York, it is estimated that the value of manurial products in excrement after we have fed our hay and grain, is not less than one hundred million dollars, annually. It has been proven in your State, by your experimentors, as well as in my own, that there is a loss of fully fifty per cent. in all the manurial products, by exposure to the elements, rain, snow and neglect; at least fifty per cent. is the loss after we have taken into consideration the cost of feed and the exposure, which amounts to fully fifty million dollars to the farmers of New York, which should certainly be saved or restored after we have taken it from the soil.

New York is noted for its vineyards and orchards as well as for its cereal products. We have had insect depredations upon our vineyards, orchards and meadows, and grain fields have also been affected by losses that occur annually, and by careful estimates made by experts, it is estimated that the loss from this source amounts to not less than twenty-six million dollars. I cannot go further into this question, because it is so immense in its extent. I only take the two items: when we come to consider that in New York, the farmers are taxed in these cases to the extent of millions of dollars, we find that here is another of the great causes for agricultural depression. Thus, losses are going on, year after year, which, to a great extent, might be prevented and which makes it imperative upon us to restore.

We had a discussion upon the dairy cow. The State of New York is not only the Empire State in many respects, but an Empire State in dairy products. It has within its borders, one million, five hundred thousand cows, one-tenth of the entire number of the United States; and yet fully fifty per cent. of these dairy cows are unproductive of profits. I have not the time to tax your minds with reference to the magnitude of this loss. Now when you take nearly one million cows that are unproductive, you will notice what an immense loss there must be in maintaining them. I can only point this out to you in this general manner in order to impress you with the idea of how gigantic are the losses coming to our agriculture today, many of which might be prevented. While these have been discouraging factors, with which you all are familiar, yet I believe there are some brighter things coming in the future. But there will be no progress or relief from depression until we shall begin to study our methods and systems of farming as we never did before; and then we will begin to see a turning of the tide and a new development.

When we find so many farmers discouraged and ready to leave the farm, and hear so much of this class leaving the country and going to the cities, there is a new obligation upon us to help. I am interested in an investigation of this character now, and we are asking the farmers of New York the questions if there is a tendency on the part of the rural population towards the towns, and if farmers are reducing their farm indebtedness? We have before us a vast amount of information on this subject. It is astonishing that in New York, the Empire State of the Union, and a State that should have a highly prosperous agriculture, that sixty-four per cent. of the rural population would be glad to get away from where it was raised. There is this general feeling and tendency among a large portion of our rural population to concentrate in already congested cities. We are going through this crucial period and test of municipal government, and are seeing many evils arising from these centres of congested population affecting the moral, political and business interests of our country. There are certain aids that are coming to us at this time in which there is much of hopefulness for the future.

As we assemble upon this ground today, at this Board meeting, we are upon most hopeful soil, because we are meeting where an institution has been founded in which the leading object is to take the youth of the State and skilfully train and educate the young men in a better and more scientific agriculture; and, hereafter, a more prosperous and profitable agriculture will receive its solution right here. Farmers should bring their sons and daughters here and educate and train them in all the questions of skilfull management of land. I predict that the time is not far in the future when there shall emanate from this State College a system of instruction which shall reach out and cover the whole State. I think I am safe in saying that in less than ten years from this time, there will not be a public school, not even a little, rural district school, but what it will have the principles of agriculture taught, and I believe therein lies one of the first remedies for the present depression in farming. The country school is yet, as it always has been, the important point to start from, as the masses receive the education they get mostly from our common schools.

We need to train boys and girls on the farm in the principles of agriculture that they may apply their knowledge to the work that many of them are to follow. I believe it is possible to enjoy a more profitable agriculture and in a higher degree than ever yet known, but we shall not realize it until we have in every school house in the country, the teaching of agricultural science. When that day comes, we shall find the boys and girls going to the district school houses of the township, and, with new life and interest, learning the elements of agriculture, while many desiring more knowledge, will take an advanced course of study. The State College and our normal schools will specially prepare young men and women to go forth as teachers to take positions in the country schools and teach the principles of agriculture. That will solve the question of discontent with farm living, because when the boys and girls can go to these district schools and learn from them to know how to avert these losses, and can study and understand the law and growth of plants and flowers, and can learn of the growth of the clover and other crops, it will give them a new interest and new life, and create in them a greater love for agricultural pursuits.

LIME—ITS COMBINATIONS AND USES IN AGRICULTURE.

BY WILLIAM L. NESBIT. *Lewisburg, Pa.*

The caption which I have selected for this paper, whatever else it may suggest, will hardly convey to the mind the idea of novelty. The use of lime in agriculture has been practiced for centuries. Not only has it been used as it comes from the kiln, but also in the form of gypsum, or land plaster. This wide, extended use of lime, covering a period of many years, bears unmistakable testimony to the fact that many farmers have found a real or apparent advantage which they attribute to its application to their soils. Others whom we must assume to have been equally careful and intelligent observers, have also tried it, and they have not found favorable or even noticeable results to follow.

The writer has thought that it might not be unprofitable here in this lime abounding region, to take up the lime question, and to study it in the light of our present knowledge, viewing it both from a practical and from a scientific standpoint.

To the chemist, there is a metal known by the name of calcium. As a metal it is of little or no use in the arts, and may be regarded simply as a chemical curiosity. But, when combined with oxygen, for which it has a strong affinity, the combination or oxide thus formed is known as lime. Lime, chemically considered, is a powerful base, capable of entering into combination with any of the innumerable acids, whether organic or inorganic, and hence there are found in nature many different forms of combinations of, or salts of lime, as the chemist calls them, having a very wide range of water solubility. The more common, and the most staple forms are the carbonates, phosphates, sulphate and silicate.

In all the limestones and marbles, in chalk and marl, and in oyster shells and other shells of shell-fish, the lime is found in combination with carbonic acid. In gypsum it is in combination with sulphuric acid. In bones, coprolites, the guanos, South Carolina, Florida and all apatite rocks, it exists largely in combination with phosphoric acid. In all the old rocks, however, which contain lime and most of them do, it is found almost exclusively as a silicate.

When a farmer takes his team and wagon, drives to the lime kiln, puts on a load of lime, hauls it to his farm, deposits it in heaps, slakes and spreads it on his land, he says he has limed that land; and so he has. But when he purchases from the merchant or dealer, ground gypsum or land plaster, and applies a dressing of it to his fields, he does not say that he has limed his land, but in fact, he has done so, So when he applies phosphate, or superphosphate or bone meal, he is at the same time applying lime; for all the fertilizers consist largely of lime. Hence, we see that the practice of liming in one way or another is far more common than at first might have been supposed.

The question of the expediency and practical utility of applying the lime of the lime-kiln to the land for the purpose of enhancing its productiveness and increasing its fertility, has been much discussed. It is a question which, in the abstract and to the apprehension of the unscientific farmer, appears to be embarrassed by much contradictory testimony.

The effects of lime are sometimes so bizarre when applied to land in experimental lots or fields, owing to unperceived conditions of soil, perhaps, or to the conditions of moisture and temperature, as to leave us often in doubt as to whether we can safely draw any general conclusions from the results we get. Under some conditions it is the unexpected that happens. First, effects may appear to be negative in their character or even seriously unfavorable. But, if favorable results appear at once or after the lapse of a little time, it is interesting to know if we can learn, just how, and in what manner, and under what conditions, they were wrought out. It might seem at first sight like an absurd proposition if I or any one should now affirm that under some conditions, a farmer may be able to supply large additional amounts of available nitrogen and potash to his crops, by liming his lands; but as we shall see, it might be true.

It will pay us to think as practical farmers, to look carefully into this lime question from the scientific standpoint, and to bring it to the crucial test of repeated and carefully guarded practical experiment; for there are some things, (and this is one of them), which we can do better for ourselves, perhaps, than anybody else can do them for us. That lime is a true fertilizer or plant food, there can be no dispute. The ample proof lies in the fact that lime is found abundantly in the ashes of all plants. It is indispensable to the growth of all forms of vegetation.

Lime is universally distributed in all soils; in very unequal percentages, it is true; but it is everywhere present. The question arises: Is it everywhere present in available forms, and in quantities sufficient to supply all the needs of vegetation? If it is, can there be any advantage in supplying more?

This question has been diversely answered. The writer believes that it is correctly answered in the affirmative. Discarding conjecture and vague generalities, let us endeavor to develop the fundamental facts in the case, to consider them carefully, and then draw our conclusions. Let us remember, also, that no science, as well as no scripture, is of private interpretation. In other words, a conclusion drawn from a partial view or knowledge of the facts in any case is very likely to be erroneous.

Practical agriculture owes much to the investigations and researches of modern chemistry. We now know with exactness, the composition, both proximate and ultimate, of farm crops of all kinds, as well as of fertilizers of every grade and class. If in any case, there is doubt, the means are at command to settle the doubt.

I will not cumber this paper with details upon which are based the general averages which I wish to give, of soil depletion, of the four fertilizing ingredients of which account is usually, or should be taken, in a four years' crop rotation; but will simply give the averages of each, for the period of four years, assuming the crops to be as follows:

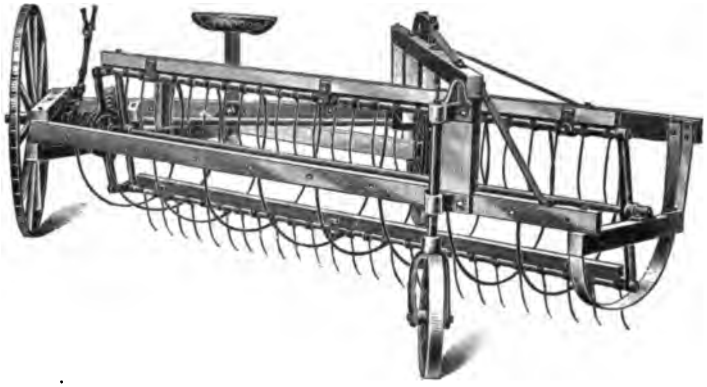
First Year. Wheat crop yielding 33⅓ bushels per acre.
Second Year. Clover hay yielding 3½ tons per acre.
Third Year. Corn ears yielding 80 bushels per acre.
Fourth Year. Oats yielding 35 bushels per acre.

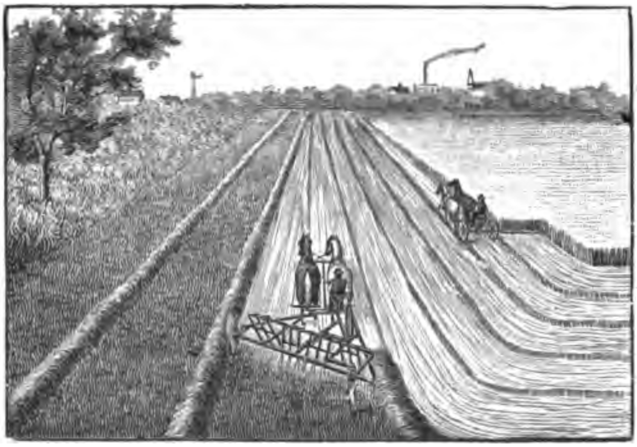
The total depletion for the four years would be about as follows: Nitrogen, 177 lbs.; phosphoric acid, 51 lbs.; potash, 137 lbs.; lime, 106 lbs.

Striking an annual average, it would be as follows: Nitrogen, 44½ lbs.; phosphoric acid, 12¾ lbs.; potash, 34¼ lbs.; lime, 26½ lbs.

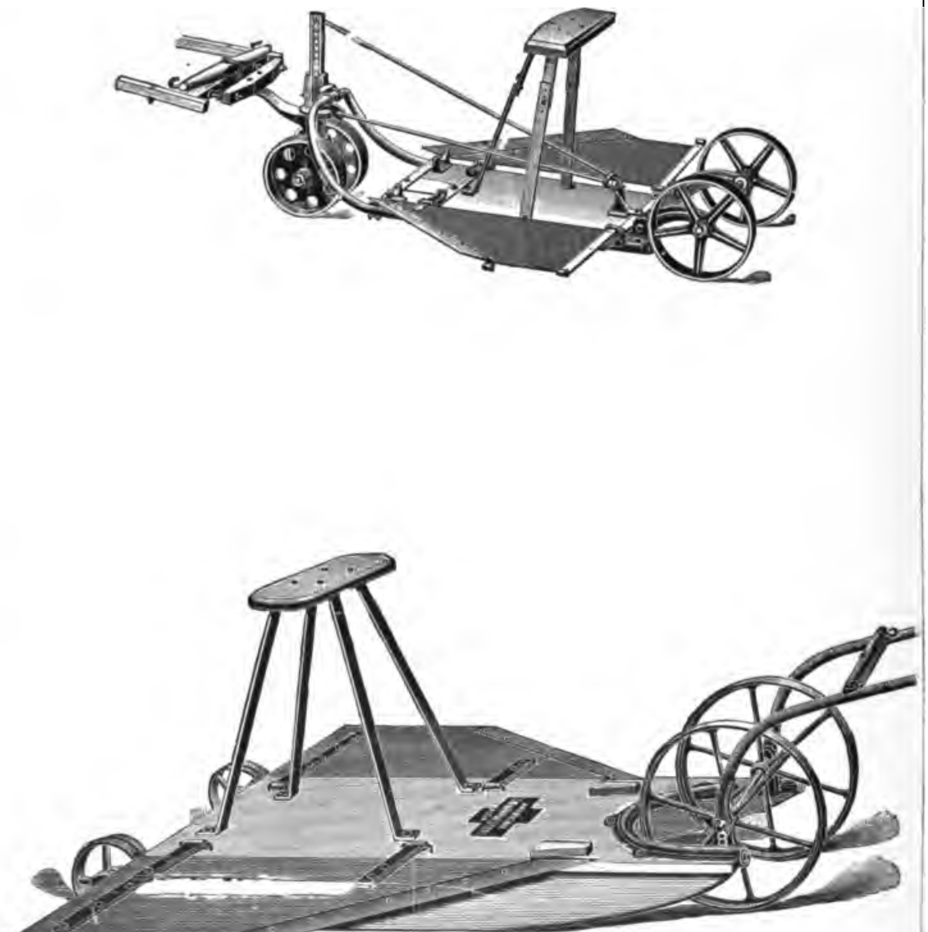
Having thus measured the annual depletion, let us turn our attention to the other side, and see what we have in reserve, in our soils, of these elements of fertility. Again for brevity's sake, I will omit details which I fear might not be as interesting to some whom I now address, as they have been to me. I will say, however, that if any one desires to verify the conclusions I shall here present, he can find all the necessary data in the published works of our leading American soil investigator, Prof. E. W. Hilgard, supplemented by like investigations of the German and French agricultural chemists, notably Krocker, Muller and Bonesingault.

The average weight of an acre of soil taken to one foot in depth is about 3,500,000 lbs. It will therefore follow that a percentage of one-tenth of one per cent. will be equivalent to 3,500 lbs. The French and German chemists have shown that soils very rarely contain less than 0.1 per cent. of nitrogen, or 3,500 lbs., while they are frequently found to contain three, four or five times that much. It is to be re-





SIDE DELIVERY HAY RAKES.



CORN CUTTERS.

gretted that Prof. Hilgard omitted nitrogen determinations in the most of his work, and so we must depend for that element upon the work of the foreign chemists.

To keep well within bounds, let us take the very lowest figures quoted for nitrogen, viz: 0.1 per cent. or 3,500 lbs., as the average of good productive soils, and one-half of this amount as that of very poor soils. Let us now select from Hilgard's tables, five representatives samples, each typical of a different kind of soil formation but all good, agricultural soils, and supplement them, as proposed, for nitrogen contents. The sample analyses chosen represent dolomite, limestone, prairie alluvial, granite and trappian soils. The average of these should give a fair representation of good fertile soils everywhere.

	Nitrogen.	Lime.	Potash.	Phosphoric acid.
Dolomite,	0.1 per cent.,	0.225 per cent.,	0.240 per cent.,	0.165 per cent.
Prairie,	0.1 per cent.,	0.960 per cent.,	0.206 per cent.,	0.318 per cent.
Alluvial,	0.1 per cent.,	0.264 per cent.,	0.160 per cent.,	0.242 per cent.
Granitic,	0.1 per cent.,	0.090 per cent.,	0.110 per cent.,	0.191 per cent.
Trappian,	0 1 per cent.,	0.389 per cent.,	0.126 per cent.,	0.106 per cent.
Total,	0.1 per cent.,	0.385 per cent.,	0.168 per cent.,	0.204 per cent.

These averages computed to pounds, taking the soil to one foot in depth and taking no account of subsoil contents deeper than that, give the following amounts: Nitrogen, 3,500 lbs.; lime, 13,475 lbs.; potash, 5,880 lbs.; phosphoric acid, 7,140 lbs.

We shall not be far wrong if we take these figures for lime, potash and phosphoric acid, as representing the actual soil contents of these ingredients existing in our best farming lands in Pennsylvania, while the figures for nitrogen would generally be found, by actual analysis, to be far within the truth. What a magnificent showing of fertility in reserve these figures present, yet in cultivating these fertile soils, we find it profitable and even necessary to use some kind of a fertilizer, at least once in every four or five years.

A high grade fertilizer may contain, let us suppose, 5 per cent. or 100 pounds of nitrogen to the ton, 8 per cent. or 160 pounds of potash and 12 per cent. or 240 pounds of phosphoric acid. An application of 400 pounds per acre of a fertilizer such as this, would be considered a heavy dressing for general farm crops. It might make a great showing in the yield of the crop, and indeed, its influence on succeeding crops might be apparent for years; yet it would only add 20 pounds per acre of nitrogen to a soil which already contains as we have seen, 3,500 pounds, 32 pounds of potash to the 5,880 pounds, and 48 pounds of phosphoric acid to the 7,140 pounds already there.

To say that such apparently trivial additions of fertilizing ingredients, to the large amounts shown to be already in the soil, could produce any noticeable results in the crops, would seem like an absurdity, but it is often a hard, solid fact, nevertheless, and it must have and does have a scientific explanation. While we are on this branch of the subject, we may as well carry our investigations a little further. Recurring again to Hilgard's tables, let us select five more analyses, this time, of the most barren and agriculturally, worthless soils analyzed or reported by him. To abbreviate and save time, I will omit the individual analyses, and give only the averages of them, supplemented for nitrogen, as heretofore indicated.

Averages of five analyses:

	Nitrogen.	Lime.	Potash.	Phosphoric acid.
In per cent., ...	0.05 per cent., .	0.065 per cent., .	0.087 per cent., .	0.101 per cent.
In pounds, ...	1,750 pounds, . .	2,275 pounds, . .	3.045 pounds, . .	5,555 pounds.

Please notice that these very poor soils represented in the analyses just given, show a far greater relative deficiency in lime than they do in nitrogen, potash or phosphoric acid. But to look at the figures, one would say that there is not only no deficiency anywhere, but on the other hand, a very large surplus of nitrogen, potash, and phosphoric acid. How, then, can these very poor soils contain such great stores of plant food, and yet prove themselves in actual experience, incapable of supporting the growth of even very moderate crops upon them? These remarkable facts also can and do have a satisfactory scientific explanation. It is simply this: That for the most part, the stores of plant food in the soil, whether large of comparatively small, are securely locked up, and only become very gradually available to plant uses, by the slow operation of natural causes. We can intensify the operation of the causes which liberate fertility in the soil, if we know how, and this is the great secret; but not the only one, in the judicious use of lime. Any blunderer can apply lime to land—after a fashion—but it requires some knowledge and the exercise of a wise discretion to use it profitably and to the best advantage.

We have all heard the aphorism, and the writer has repeatedly met with it in the agricultural literature of Pennsylvania, that the use of lime upon land "enriches the fathers but impoverishes the sons." I do not quite agree with the fellow who said that he was "under no obligations to posterity, as posterity had never done anything for him." But with all due regard for the rights of posterity, we may, I think, reasonably claim our just share of the good things in store, laid up by the Creator for our ancestors and for ourselves, as well as for posterity. The ethical question involved is not, however, a very practical one, as we shall show.

According to the tables we have given, placing the reserve nitrogen supply of a good soil at the very low estimate of 3,500 lbs per acre, and the average annual draft upon it at 44½ pounds, it would require 78 years of cropping for its complete exhaustion. Placing the phosphoric acid supply at 7,140 pounds, and the average annual draft upon it at 12¾ pounds, it would require 560 years for its exhaustion. Placing the potash supply at 5,880 pounds, and the annual draft upon it as 34½ pounds, it would require 171 years for its exhaustion. Placing the lime supply at 13,475 pounds, and the annual draft upon it at 26½ pounds, it would require 509 years for its exhaustion.

The writer once heard an eminent scientific lecturer describe that great geological event known as the glacial era, or ice age, and the causes which produced and then superceded it. He said that these causes were active and in full operation still, and would undoubtedly, at the appointed time, bring on a recurrence of that phenomenon, but in order that his audience might not be disquieted or lose any sleep on account of it, he would say that that event occurred one hundred thousand years ago, and would not be due again for a hundred thousand years to come. So, in our farming operations, we need not, I think, worry very much about the rights of posterity that may be involved, if we should conclude to make a little judicious use of lime to render available some of the soil's store of reserve fertility.

We now come to a branch of my subject, the action of lime in the soil, in which it will be impossible for me to proceed without the use of some technical terms, and without reference to some chemical reactions, which, in the nature of the case, must be more or less obscure to anyone who has little knowledge of the science of chemistry. I shall not lose sight of the fact, however, that this paper is designed for the use of practical farmers, and not for the schools. I anticipate that I shall be met at the very threshold of the discussion by the thoughtful farmer, with the question: "If the soil already contains the great superabundance of lime you say it does, what good can it do to apply a little more?" I reply, that, considered as a plant food simply, none whatever; but as a chemical reagent, much, in several ways. As plants can undoubtedly appropriate lime to their uses, taking it from any of its numerous forms of combinations, so far as they are soluble, we may dismiss it from our consideration as a plant food merely, just as we do carbon, oxygen and hydrogen, all equally necessary.

In the primary rocks, that is, those formed in the first cooling of the earth's crust, lime is found exclusively as a silicate; that is, in combination or chemical union with silica. This, then, is the original source of all the myriad tons of lime now found in other forms of combination. Its change of association is due entirely to chemical forces. Our soils are formed in two ways: First, by the mere grinding up or pulverization of the rocks by mechanical force of some kind, and second, by the agency of chemical forces effecting a change of association between the ultimate atoms.

A large percentage of the constituent materials of all our soils, but not by any means a uniform percentage, consists simply of rock flour so to speak, or of rock ground up and chemically unchanged. Hence a large portion of the lime, potash, soda, magnesia, etc., in our soils is still in the original and inert silicate form. They are slowly changing all the while to the far more active carbonate and sulphate forms, but as they do so, they are appropriated by vegetation or rapidly leached out by the soil waters, and carried off into streams. This explains why it is that limestone soil, or soils formed by the decomposition of limestone rocks, are sometimes lacking in the active forms of lime, even, and so respond to a dressing of lime in an active form, just as do other soils.

While water alone, or water aided by heat and pressure, and by other agents carried in solution, may be regarded as a universal solvent, yet its solvent action on many substances under ordinary conditions is very slight. This is true of all the silicates. Hence, silica may be regarded as one great conservator of the earth's fertility, lime being another, which would otherwise long ago have found its way to the waters of the ocean. Thus it will appear why it is that the large amounts of reserve potash, lime, soda, magnesia, etc., whose presence in our soils is revealed by chemical analysis, do not manifest their presence in the crops, viz., because of their very slight water solubility.

The Creator has wisely bound some of them hand and foot, notably potash and phosphoric acid, by silica, in order to prevent their escape and the consequent impoverishment of the soil. So long as they remain thus bound, they are like the strong man in chains, helpless, inactive, and their inherent powers more or less completely neutralized.

Nature's process of gradual liberation, while always more or less active, is not always rapid enough in its action to maintain the high standard of soil fertility required for our modern and intensive systems of agriculture. So man's intelligent intervention in aid of those processes becomes necessary. In our efforts to assist the natural agencies, and if need be, to supplement their work in the provision and preparation of a sufficient supply of food for the use of our crops, by outside contributions, it behooves us to move considerately and discreetly, lest we incur unwarranted expense, largely lose our labor through our misdirected efforts, or perhaps do positive harm by our unwise intervention. Lime, as it comes from the kiln, or carbonate of lime, as it soon becomes upon exposure to air and moisture, is not only one of the most efficient agents for the gradual breaking up of silicate combinations, in the soil, but it is at the same time, almost everywhere the cheapest. These facts indicate that it is generally the best agent to employ. There are, however, very often soil and other complications, some easily understood and others difficult to explain, which determine the preference for lime in some other form, namely as sulphate or as phosphate. For instance, a surface dressing in the summer time should be in the sulphate form, even at a considerably higher cost, for several reasons, chief among which is its power to arrest and fix escaping ammonia and to entrap it from the air.

Another reason for sometimes preferring the sulphate form is, that as the difficult soluble soil phosphates cannot well be much acted on in the soil, directly, by any chemical agent we can employ without applying quantities that would be ruinous to vegetation and utterly forbidden by the cost; it is at first generally better to reinforce our soil supply of phosphate by direct purchase.

Now, in purchasing bone or rock superphosphates we actually get more than twice as much sulphate of lime as we do superphosphate in the same package, and if we consider that we have paid our money for the superphosphate, then we have the sulphate of lime, or gypsum, for nothing, which is certainly as cheap as we could ask.

Besides the reasons here advanced, there are often more or less intricate soil complications that it would not be profitable to attempt to explain here, which may determine the choice in favor of the sulphate form. The practical farmer can best settle the question for himself by careful experiment.

The action of lime on soil nitrogen is one of its most valuable services, as is well known, some forms of nitrogenous materials very stoutly resist nature's process of decay. Hair, leather scraps, wool waste, hoof and horn scrapings, etc., are familiar examples. So are muck, peat and many of the forms of vegetable humus found in the soil.

The decay of any of these substances is greatly promoted by the action upon them in the compost heap of caustic lime; or of potash as it is found in unleached wood ashes. So the presence of an ample (not excessive) supply of carbonate of lime greatly promotes their decay in the soil, and the conversion of the nitrogen they contain into ammonia and nitric acid; thus rendering it available as plant food.

Finally, the application of lime to soil affects its mechanical condition. There are few of us, I venture to say, who have not witnessed the stone-mason's preparation for the making of mortar to lay up a stone wall. He first levels off a place upon the ground and throws a flooring of an inch or two of sharp sand upon it. Then upon that he places a small heap of burned lime, fresh from the kiln, then builds a low wall of sand around the heap of lime and pours water upon the lime to slack it. Soon it crumbles and falls to pieces, heats, and, with the addition of more water, becomes a thick, milky paste. It flows out against the circumvallating wall of sand, and almost immediately converts that porous structure into a water-tight barrier.

Lime compacts sandy soils and enables them better to conserve their water supply in time of drought

Singularly enough, to the common observer, its action on heavy stiff clay soils, too compact already, is just the reverse. It flocculates or binds together their fine particles into larger masses, and so renders these soils more porous, more easily tillable, earlier, warmer, and more permeable to water› air, and the roots of plants.

To the practical farmers, I would say, use lime, not blindly and indiscriminately, brut considerately and judiciously. Apply it in small quantities at a time and frequently. On very sandy or very clayey soils, use in the caustic setate, as it comes from the kiln. Apply on plower land, slake quickly and without excess of water to a dry powder; spread at once and harrow in, so as toget the benefit of its causticity. For other soils, it is generally better to air slake, under cover, and allow time for a considerable part of it to revert before applying to the soil. Never mix it with phosphates, or with any nitrogenous commercial fertilizer, nor apply it at the same time with them.

Do not mix it with hen manure, nor stable manure, nor apply it in close connection with them, unless in the sulphate state, that is, as gypsum or land plaster.

Carefullly note the results of all experiments with it in every form, and they will furnish the best guide for your future practice. Use your eyes and your brains, and diligently study the problem in all the varying phases in which it presents itself in your particular cases. You will meet with fantastic results sometimes, in the course of your experiments, so you must be forewarned not to draw hasty conclusions from, nor to rely too implicitly upon the results or supposed results, of any single experiment, for if you do, you will be often misled. If any of you are cultivating soils, as most of you are, that have been unduly taxed in their productive capacity by having been subjected to improvident and mistaken methods of cultivation, you will find the intelligent and judicious use of lime in some of its varied forms, in connection with clover, to afford the best and cheapest means for its speedy and complete rejuvenation.

OUR PENNSYLVANIA FORESTS.

BY PROF. JOHN HAMILTON, *State College, Pa.*

One hundred years ago, "Penn's Woods" was a noble forest; but now the 29,446,400 acres of timber land that then existed, have been reduced to less than 7,000,000, and of this not more than 1,000,000 acres of valuable timber yet remains. The largest portion of this vast inheritance has been wholly wasted, and now the effects of our own and our father's prodigality are becoming felt.

In 1810 the average price of lumber in Centre county was $3.67 per thousand feet and the total output in the State was less than seventy-four million feet (73,747,640). In 1873 or only 63 years later there were rafted out of the Williamsport boom alone over three hundred and eighteen million feet (318,342,712); and the price has risen until the finer grades are already beyond the reach of all except the rich. In 1810 that which then seemed inexhaustible, has become in 1893, the space of only one lifetime, extremely scarce.

In 1852, from Unionville, east of the Alleghenies, to Erie city, was an almost unbroken forest; and now after only forty years, there are not one hundred acres of valuable timber anywhere on the line of the old Erie pike.

We find it is published, that during the year ending June 30, 1886, we imported 1,336,039,044 feet of lumber from abroad, and this occurred in the face of a duty that was intended to prevent that very thing. We find also that the demand for foreign lumber continued; for in 1891, only two years ago, we imported lumber to the amount of $21,772,185. What a comment these figures are upon the wasteful practice of those who have control of the forests and timber lands of the United States? But, so far from being warned by these indications of lumber famine, the slaughter still continues and now (1894) there are in Pennsylvania,ready for work 983 saw-mills, with an actual daily capacity of 27,190,000 feet of lumber, and shingle mills enough to cut 5,415,000 shingles from sun to sun. Taking the entire country over, there are about ten thousand saw-mills (9,936), fit for use, with a capacity of 250,745,000 feet of lumber and 96,295,000 shingles every day.

In addition to this enormous annual sacrifice of standing timber, there is great destruction every year from forest fires. More than 12,000,000 acres were burned in 1891, representing a loss in money, to the country, of over $25,000,000.

At the present rate, in fifty years the entire 500,000,000 acres of forests remaining in this country will have been exhausted and the nation will have to depend for its supply upon foreign lands; upon countries where such extravagant waste as ours is not permitted, and where intelligent methods for the preservation and growth of forests are enforced.

The White Pine forests of the United States are already practically gone, and only 500,000,000 acres of all other kinds of timber left. From this supply we are now abstracting 22,000,000,000 cubic feet each year, or at the rate of about 340 cubic feet per capita per year; as against 40 cubic feet in England, and 14 cubic feet in the German States.

Twenty-two billion cubic feet of lumber taken in this country every year; the supply of lumber almost gone; and scarcely one of the timber States has taken measures for the planting of a single tree. Only fifty years of timber now in sight, lumber increasing rapidly in value every day, yet nothing done. This devastation continually taking place and growing more destructive every year, in the full knowledge of the fact that it takes a century to grow a pine. Surely something is radically wrong with the policy or want of policy in a government that permits a crime against posterity such as this. And it is a crime. For with the deforestation of this State not only will the value of this, one of the necessaries of life, rise beyond the reach of ordinary men, but other evils far more serious will occur.

The Almighty in his wisdom clad the earth with trees; not for the single purpose of providing fruit and yielding material for man's domestic use; but other important ends were to be attained through the instrumentality of these vast forests of "living green."

The purifying effect produced by plants upon the quality and composition of the air we breathe, whereby the surplus carbonic acid that pervaded the atmosphere in creation's dawn is now locked up in the fibre of the wood, is also a part of their influence upon the climate and surroundings in which we live.

Their influence, too, upon the electrical conditions of the atmosphere, in disarming the storms that sweep across the earth of their electric power, until they cease to be destroying agents, but are rendered instead, beneficial to mankind, is another of the marvelous powers with which trees have been endowed. The tips of leaves and twigs with their countless points, like millions of steel conductors, restore the equilibrium of electrical conditions and thus protect the lives of animals and men in wooded countries from the destruction that falls upon treeless regions or barren plains.

Forests also shelter the earth from winds. To what extent they do this, we who live in the midst of trees and other vegetation, scarcely know. If, however, one takes a trip across the Colorado desert, he can see the effect that wind produces upon the earth when the surface is exposed and bare. There, for two hundred miles, the winds have cut away the earth to depths varying from forty to sixty feet, leaving here and there monuments that show the original level of the land; the shifting sands along the Columbia river, where the air is constantly filled with the finest grit and railroads are drifted shut more effectually than with snow; the dunzs of New Jersey, where the sands drift to such a height, that a vast forest is even now being covered and destroyed, are instances before our eyes of the destruction to which treeless lands are everywhere exposed. The ploughed lands here in Pennsylvania are yearly deprived of large quantities of soil, through the action of the winds that sweep the dust away in clouds and thus rob the soil of its most fertile parts.

The intervention of wood lots here and there, form eddies, thus impeding the action of the wind, and protecting the open fields from their full effect. In these eddies the dust and large quantities of earth that are held suspended, are deposited, and through this action of the trees, the air is thus rendered comparatively free from fine dust, and becomes less injurious for animals to breathe. What this means, can only be appreciated or understood by those who have had experience with the dust storms that occur in treeless deserts, where, for days at a time, these storms continue and often cause destruction to human life.

Whether or not forests cause a greater fall of rain over the districts in which they grow, is as yet, a controverted point. However that may be, one thing has been determined, and that is, that forests to a great extent prevent evaporation of the moisture that the earth receives. That there is more moisture under trees than in the open field, is witnessed by the moss that grows on the shaded roof, and by the dampness of houses surrounded by dense groves of trees. The shaded public road is known to all as damp and wet, and the presence of luxuriant growth in shaded and protected spots, all indicate the moist condition of the soil, whilst in the contiguous open field, the soil is comparatively dry. Careful experiment, also proves that more moisture is evaporated in the open fields than in the woods. Two jars of equal size were taken and filled with water. One was sunk in the earth in the open field, the other in shade. "The water in the one in the open field evaporated twice as fast as the one in the shade." "The excess of evaporation in six days amounted to one inch more in the jar that was exposed than in the shaded one. Continuing at this rate for 102 days, or about three months and a half, the amount evaporated in the open field would be seventeen inches more than in the shade, or about 500,000 gallons to the acre."

Another experiment showed that "water kept in a room evaporated only eight inches in a year, while that in the open air evaporated forty-eight inches in equal time."

This action of the forest in protecting the soil against evaporation is largely due to the fact that forest trees shield the earth, not only from the direct action of the sun, but also from the drying winds that rapidly drink up the moisture of the open fields. The mass of decaying leaves that covers the surface, also preserves the dampness and excludes the air so that the rain that falls, does not evaporate, but follows down along the roots of trees, deep into the soil below, until it descends beyond the reach of evaporation and is thus preserved.

But, the actual quantity of rain that falls by no means measures the amount of moisture that the soil receives. The absorption of dew, is in many localities, greater than all of the rain fall of the year. The process of the formation of dew is familiar to all, depending upon warm air saturated with moisture coming in contact with a cooler surface, and thus by contraction the moisture is expelled. Many experiments made by observers in foreign lands have established the fact that the air within the forest is cooler during the day than that in the open field or immediately over the forest top; and at night the outside air becoming cooler than that below the crown of forest trees, descends, and mingling with the moist and warm air below, cools it, and its moisture is deposited in the form of dew, which is absorbed by the soil beneath. Thus a vast amount of moisture is supplied to forest lands which the open fields do not receive. Thirty-nine States in Europe give as the average result of many observations, that the temperature of the air in the forest is about six degrees cooler in summer and three degrees warmer in winter than the air outside; and that the soil in the forest is about seven degrees colder in the summer than that in the open field, and that after the first foot is passed, the temperature is nearly the same to a depth of about four feet. The fact therefore that the soil, even during the day, remains cooler than the air, not only prevents evaporation, but by cooling the air in immediate contact with it, condenses its moisture and so adds to the amount already stored. The action is not unlike that of a cold water pitcher on the surrounding air on a sultry day.

Forests also serve as vast storage reservoirs for holding the supply of water that is to serve the purpose of man during seasons of drought. When rain falls upon any impervious surface, such as a roof, almost the entire amount is shed and runs away. During the continuance of the rain, the channels will run full, but immediately upon its ceasing, they are dried up and cease to flow. If on the other hand, water be poured upon a porous surface, as a sponge, all will be absorbed and none escape until the point of saturation has been reached, when a quiet, trickling stream will flow gently and evenly from its sides, and long after the addition of water has been discontinued, the flow will be maintained.

This exemplifies in a measure, the action of forests upon the fall of rain. The hard surface of open fields sheds much of the rain that falls, and as the surface waters accumulate in hollows and ravines, they form rushing torrents, carrying destruction in their path, and after they have expended their forces, great washes, ruined fields, flooded meadows, and broken bridges mark their course. When on the other hand the rain fall is over an extended forest, the porous soil like a vast sponge, retains the water as it falls, until the earth becomes saturated to great depths, so that not until weeks after the rain has ceased, do the drops that fell, find their way to springs which flow from hillsides and thus find innumerable rivulets and creeks which furnish steady power for factories and mills, and united in great rivers, provide a safe and permanent highway for the commerce of the land.

On the certainty and permanence of this action, the welfare, if not the existence of nations depends. Vast areas, once thickly populated, have been rendered uninhabitable by the destruction of the timber that once covered their surface. The plains of Babylon and Nineveh, the hills of Judea, the mountains and valleys of France, and numerous smaller districts, testify to the calamities that fall upon the country that neglects to reserve a suitable proportion of forest area for protection against the too rapid flow of surface waters, and the consequent inundations that ensue.

Marsh in his work, "Man and Nature," gives the history of three provinces in the south of France, Dauphin, Avignon and Provence, a territory of 14,000 or 15,000 square miles, or about one-third of the size of Pennsylvania. Within the knowledge of history, this was a densely populated and most fertile district, but by continual destruction of the forests, the country was visited by great storms and floods, and the result was that large districts were destroyed and the inhabitants driven from their homes.

The Commune of Barles, 1707: "Two hills have become connected by land slides and have formed a lake that covers the best part of the soil." A later report in the same district, (1746), states: "New slides buried twenty homes comprising a village, no trace of which is left; more than one-third of the land has disappeared."

Monans, 1724: "Deserted by its inhabitants and no longer cultivated." Gueydan, 1760: "The best grounds have been swept off and ravines occupy their place." Digne, 1762: "The river Bleone has destroyed the most valuable part of the territory." Malmaison, 1768: "The inhabitants have emigrated, all their fields have been lost." "One-half of the territory of the Commune of St. Laurent du Var, has been laid waste."

The report of assessor, Serrairc, to the French Assembly, says: "As to the damage caused by brooks and torrents, it is impossible to deny its extent. Upper Provence is in danger of total destruction and the waters which lay it waste threaten also to ruin the most valuable ground on the plain below. Villages are in danger of being submerged by torrents which formerly had not even names, and large towns are on the point of destruction from the same cause."

Viscount Puget, 1776, reports: "The mere aspect of Upper Provence is calculated to appall the patriotic magistrates. One sees only lofty mountains, deep valleys with precipitous sides, rivers with broad beds and little water, impetuous torrents, which in floods lay waste the cultivated lands along their banks and roll huge rocks along their channels; steep, parched hillsides, the melancholy consequences of indiscriminate clearing; villages whose inhabitants, finding no longer means of subsistence, are emigrating day by day; houses dilapidated to huts, and but a miserable remnant of population."

This is only a small part of the story of disaster that has come upon the districts in the south of France. "River beds are filled with sand and stones,' 'surrounding districts are overflowed,' navigation is no longer possible,' 'water powers are destroyed, and the whole district ruined.' Along with the forests go the springs, and with the springs and supply of rivers until, waters once navigable for the entire year are now mere mountain torrents, that fill with great rapidity, and then, are little more than insignificant streams flowing through rocky beds."

But we need not go to foreign lands for examples of the effects of deforestation on the flow of springs. The Arkansas river in Colorado, flows through the most magnificent mountain range in the world. These mountains are largely destitute of trees, and for a distance of 157 miles, from Pueblo to Leadville, there is only a single tributary, and that but an insignificant stream that enters the river at Salida. Although I made this trip in the month of May, this was the only stream that I saw; but on every side were the marks of terrific torrents that had seamed the mountain sides, and had torn out vast canons in their course.

Surely these authentic records of the evils that come from clearing off the soil, ought to cause us, to at least, consider whether we too, by our present course, do not invite the same disasters that have befallen other lands.

Forests also hold the snows. Under their cover, the earth is not frozen to the depth that it is in the open field, and consequently, when the thawing season comes, the forest soil is ready to receive the water of the melting snow, whilst that which is in the open field is unable to penetrate the earth by reason of the frost, and is therefore lost.

The thawing, also, takes place more gradually in the woods, and more time is given for the waters to be absorbed, or if they flow away they disappear less rapidly and do little damage to the land below.

If forests then did no more for us than this: preserve the sources of our supply of water and ensure their even and continual flow throughout the year, their preservation would be of the utmost importance to the State.

We are just now emerging from the era of steam to that of electricity. For the economical manufacture of this new force, the attention of scientific men is now directed to the water power that lies unused throughout the land. Power sufficient to drive all our machinery, light the nation and heat her dwellings, now goes to waste. But as soon as the system of storing electricity is perfected, this unused power will become extremely valuable and important to the State. How important then for the welfare of business, traffic, and domestic comfort, is the care and preservation of these fountains that are soon to be harnessed to the industries of the State? How soon the rivulet that runs by your door may be applied to the heating and lighting of your home, and to the plowing and cultivating of your land and the harvesting and threshing of your crops, no one knows. How soon it may be applied to the carriage that conveys you and yours along the public highways of the State, cannot be definitely stated now; but that it will be within the next fifty years, is very sure, and when that day comes, water rights will be in demand and their use will revolutionize the age. Even now Niagara is being compelled to labor in distant cities, and the day is not far distant when every farm will have an electric plant to drive an electric plow.

The State will also have to meet the problem of securing wholesome water for her vast population congregating in the cities and suburban villages so rapidly developing within her borders. Even now, Philadelphia and Pittsburgh suffer during certain seasons of the year, and as they increase in population and other cities arise to share with them the supply that is inadequate even now, what enormous expenditures of money will be required to meet their hourly need? This problem cannot be long deferred, for at the present rate of growth we shall soon have many millions dependent upon a single stream. A century ago there were but six cities in the entire bounds of the United States that contained over 8,000 inhabitants. Now, in our own State of Pennsylvania, we have forty-three cities with over that amount of people each, and in three cities: Philadelphia, Pittsburgh and Allegheny, there is a population of 1,390,868 souls. In the last decade these forty-three cities increased 36.51 per cent. Let this rate of increase continue for another one-hundred years, and these forty-three cities will have a population of 44,198,429 people, or over 1,000,000 each. This, with the growth of other cities that will arise, will make the question of the supply of water one of extreme importance to that age.

But these are only incidental advantages that forests secure. When we consider the quantity of lumber that will be needed to house this vast poulation, and all that will be needed for every kind of public and domestic use, we can begin to appreciate the importance of this subject to the State. If the 208,612 miles of railroad that now exist in the United States use each year 1,877,508,000 feet (board measure) of lumber for ties alone, what will their directors do when the railroad system reaches 1,000,000 of miles requiring 9,000,000,000 feet of lumber for ties every year? This is but one among the many industries that will then exist, and be equally dependent upon the supply of timber for support.

Is this a long look forward in the economics of a nation such as this? Is this occupying our attention in this year 1894 with subjects too remote, especially when we remember that it takes a hundred years to grow a pine and two hundred years to mature an oak? Is it not time for some authoritative voice to cry, "Woodman spare that tree?"

Who shall utter this command? I answer unhesitatingly, the order must be given by the State. No private individual can hope, unaided, to bring about the desired result. The time that is necessary to mature a crop, and the absence of laws of primogeniture, or entail, will deter individuals from attempting a task the benefits of which must accrue to the advantage of a generation yet unborn. The State manifestly must assume control, for it never dies, and its interests always remain the same.

How shall this control be brought about? I answer, by the purchase, as far as possible of all unseated lands. Throughout the State there are large districts that can never be put to profitable use for the purpose of agriculture, owing to their location on rocky slopes and to the quality of their soils. All such tracts should be purchased by the State, together with all lands that are forfeited for tax. These lands should be put under the control of competent foresters, who should see that they are planted in timber of valuable sorts, and that the growing trees are properly cared for and protected from injury from every source. Strict laws should be enacted regulating fires and providing for their extinguishment whenever they are discovered. To aid in this, railroad companies should be held responsible for fires along their line of road and fire guards should be required of them, to patrol their road during the season when fires are likely to occur. The roadsides for at least four rods wide through forests should be kept clean and free from inflammable materials, and the superintendent and section boss should be held liable, under penalty of fine and imprisonment, for neglect of duty in this respect. All constables, overseers of the poor, road supervisors, school directors, justices of the peace and sheriffs, should be fire wardens, whose duties will be to see that fires are promptly extinguished when they occur, and take measures to discover their cause, and secure the arrest and punishment of the guilty. These officials to be paid for the time actually used in the discharge of their duty, and have power to call upon any citizen for aid, the citizen to be paid for such service as he may render.

It is objected that this would prove a very expensive and complicated department of State control, and open the way for all descriptions of speculation and fraud. The answer to this is, that, in countries where similar systems have ben practiced for many years, no such difficulties are found to exist. The great number of those on guard, whose sworn duty requires them to discover and report those who violate the law, renders it extremely difficult for the guilty to avoid detection or escape the punishment of their crimes. The expense of such an undertaking is necessarily very great, but great as it undoubtedly must be, the revenue derived from this investment will, as I hope to show, abundantly justify all of the outlay that it requires. Let us for a little while examine the financial side of this question as it appears.

The Commonwealth of Pennsylvania contains about 46,000 square miles of land, which is equal to about 29,440,000 acres. Of this about 7,000,000 is in woods, or a little less than one-fourth of the entire State is now covered with forest growth. In Europe, about one-fourth to one-third is the proportion of woods to cultivated fields; the general average being 29.5. The present area in woods in Pennsylvania is very nearly that of the countries where forestry has long been practiced; that of Germany being 25½ per cent. whilst here in Pennsylvania we have 24.3 per cent. "The government forests in Germany amount to 12,000,000 acres; private and communal forests, 22,000,000 acres; making a total of 34,000,000 acres.

These forests produce annually about 55 cubic feet of lumber per acre, or a total of 1,870,000,000 cubic feet. The total gross income each year is $95,000,000, and the entire expenditures are $38,000,000, or 40 per cent. of the income; leaving a net profit of $57,000,000.

The $38,000,000 of expenses are made up as follows: Sixteen per cent. for cultivation, roads, etc.; 32 per cent. for lumbering; 52 per cent. for Administration or protection. The expenses amount to about $1.12 per acre and the profits to about $1.60 per acre each year.

Similar profits are realized on other lands.

The Budget from the Prussian Forest Department for the year 1886-7, showing a total average in forest of 5,943,896 acres is given as follows:

"Annual income according to the average for the last five years is $13,344,520. The total average expenses were, each year $7,392,785 giving a net annual income of $5,951,735."

Here the expenses were divided as follows:

Administration,	33.8 per cent.
Labor and material,	56.7 per cent.
Scientific purposes,	0.6 per cent.
Miscellaneous,	8.9 per cent.
Total,	100.0

(Fernow, pages 185-186.)

Let us now apply these figures to the conditions as they exist in Pennsylvania. If the 7,000,000 acres of wood land in Pennsylvania could be purchased for an average of two dollars an acre, (and undoubtedly a large portion of it could be bought for less), they would cost the State $14,000,000. The interest on this for 90 years at .03 per cent. would be $37,800,000, which added to the purchase money, would make the total amount invested, $51,800,000. At the end of 90 years, the wood on that land would be worth, according to the German and Prussian experience, $2.72 per acre for each year of growth. One dollar and twelve cents of this would be for expenses and the balance of $1.60 per acre would be clear profit. This would make the 7,000,000 acres worth, clear of the expense of maintenace, the sum of $1,008,000,000 or a clear profit after deducting the cost of the land and the interest, of $956,200,000.

The expenses of the State government of Pennsylvania in 1889 were $8,182,847.34. This profit on the wood lands of the Commonwealth at the end of the 90 years, would pay the entire expenses of the State for 90 years at the rate of expenses in 1889, and the State Treasurer who went out of office in 1983 could pay over to his successor in addition, the sum of $219,743,770.

But the point is raised that it would be impossible for the State to ever secure all of the wood lands of the Commonwealth, inasmuch as they are distributed in the hands of individual owners and are part of farms that the possessors would not sell at any reasonable price. Undoubtedly this is true, and being true, what ought to be the policy of the State towards these individual owners?

Under the present system in Pennsylvania, no one can afford to own woodlands and hold them for a period of forty years, much less ninety. The system of taxation is such that they will be confiscated by the State. Let me illustrate what I mean. I know of a tract of land in Centre county, containing 190 acres, that was cleared of its timber just about 40 years ago, and allowed to grow up again, so that the present timber growth represents the growth of about 40 years. The annual tax on this is $16.63. This sum paid annually and compounded for 40 years at 6 per cent. would amount to $2,727.32. An effort has been made several times to sell the timber, and although it is situated along a railroad and is easily worked, the highest price ever offered for the stumpage is $9.00 per acre which would be for the tract $1,710.00; or $1,017.32 less than the sum paid for taxes in the last forty years. If the tract is held for fifty years, the tax would reach $5,116.58 and if $12 per acre were then offered for the stumpage, the loss to the owner would be $2,838. Part of this tract was cut off and the entire product was 25 cords of wood to the acre, which at 40 cents per cord, would be $10.00.

But this is only part of the loss that the owner of the land sustains. If the land itself were worth originally $2.00 per acre, this sum at compound interest at 6 per cent. for 40 years would amount to $20.57 making the 190 acres cost without the taxes, $3,908.30 which sum added to $2,727.32, the amount paid for taxes would make a total cost of $6,635.62; and all that the land will bring is for the timber, $1,710; and for the land, $380; a total of $2,090; making a net loss to the owner in forty years of $4,545.62.

I know of other cases where the tax on unseated lands this year is 30 mills, on a valuation of $10 per acre. The tax therefore for forty years would be $52.21 per acre, and the land reckoned as worth $2.00 per acre, compounded for forty years would be $20.57 more, making the property cost $72.78 per acre, or $13,828.20 for the 190 acres.

If the value of the land is the same at the end of the forty years as in the other case, the net loss to the owner would reach the sum of $11,738.20.

This explains why there are 938 saw-mills in Pennsylvania to-day cutting out her forests as fast as steam can drive their saws; and this also explains why it is, that large districts that are annually cleared of all the value that they possess, are abandoned by their owners as not worth the taxes that are yearly assessed.

In view of these facts what should be the policy of the State toward the holders of wood lots within her bounds; and how shall she induce these private holders to stay their hands and protect the timber from destruction? There are at least two methods by which this can be done. The first is to free all timber lands from taxation and levy tax only on the product that may be removed. As, for instance, tax the lumber that is sold and the cord wood that is cut. This would tend to arrest the destruction of the timber, inasmuch as the only expense that the owner incurs in its preservation is the money that he has invested in the land and the interest that annually accrues, and yet a reasonable tax would be secured by the State from fire-wood, bark and timber annually cut. Objection may be raised to this by districts which are composed principally of unseated lands, because the relief of their lands from tax would diminish their revenue to the extent of making it impossible to meet the expenses of local government in their midst. I regret that there is not time to discuss this question in detail, for then I would expect to prove that which I can now simply assert; that in the near future, the State will assume all of the expenses of local government, such as the care of roads, schools and poor. Taxes for their support, will be levied only on productive property according to its productive power, and distribution will be made to the several districts of the State according to their needs. When this is done, then the objection to removing the tax on wood lands will lose its force.

The other plan that I propose for the preservation of our woodlands is, I believe equally simple in its execution and salutary in its results, and is also absolutely fair to the individual and to the State.

Let all unseated lands and woodlots be valued from the best obtainable data, at their cash value ten years ago. Let them also be valued at their cash price to-day. If these lands have risen in value, divide the difference in price by ten to get the annual increase, and let this annual increase represent 6 per cent. of the sum on which the millage should be laid. For example, where the cash value of the land on the first of January, 1883, was found to be six dollars per acre, and its value January 1st, 1893, is nine dollars per acre, the increase in the ten years is $3 or .30 per year. This .30 is six per cent of $5, and the land therefore for purposes of taxation should be rated as worth five dollars per acre. This is done on the principle that a man ought to be able to realize as full interest on his money invested in wood lands, as if he were to invest it in improved property or ordinary business; otherwise he will refuse to hold the unproductive property and will strip it of its value and then abandon it to the State.

If the timber is to be preserved by the individual, the State must make it to his pecuniary interest to protect it, and make it possible for capitalists to invest their surplus funds in wood-lots and keep them intact until the growth shall have reached maturity, thus accomplishing the object of the State—the preservation of the forest lands.

In order that forest lands may become remunerative to the State, it will be necessary, as I have intimated, to have them planted with valuable varieties of trees, and these would have to be cared for by competent foresters, who would see that the condition to favorable growth was constantly maintained. The effect of this would be to instruct private owners in the best methods of timber culture, and the well kept forests of the State would be a constant object lesson to her citizens, stimulating them to the exercise of greater care in forest management, and would eventually result in the wood lot becoming the most valuable income producing portions of the farm.

Many more facts and suggestions might be presented if there were time, showing the supreme importance of this subject to the citizens of the State. That it is important, and that it does affect in a vital manner the prosperity and welfare of our people, is ascertained beyond a doubt. It now remains for those of us who are interested in the future of our Commonwealth and people, to initiate the movement that will bring about the results we desire.

WHAT A FARM DEED INCLUDES.

BY HON. GEORGE W. HOOD, *Indiana, Pa.*

Chancellor Kent tells us that, "A deed is an instrument in writing upon paper or parchment, between parties able to contract and duly sealed and delivered." A deed is sometimes called a charter; but most usually when applied to the transaction of private subjects it is called a deed, because it is the most solemn and authentic act that a man can possibly perform, with relation to the disposal of his property.

Formerly, when deeds were more concise than at present, it was customary to write as many copies as there were parties, and each cut, or indented like the teeth of a saw, on the top side, to tally or correspond with the other, which deed so made was called an indenture. But for a long time indenting has only been in use to give name to the species of deed.

The most important considerations are the requisites of a deed. The first of which is, that there be persons able to contract, and be contracted with for the purposes intended by the deed; and also a thing or subject matter to be contracted for; all of which must be expressed by sufficient names. In every grant there must be a grantor, a grantee and a thing granted; as in every lease a lessor, a lessee and a thing demised. The deed must be founded upon good and sufficient consideration. The consideration may not be expressed but it must exist. A deed without consideration is of no effect. If the consideration is upon usurious contract, upon fraud or collusion, either to deceive bona fide purchasers or just and lawful creditors, any of these bad considerations will vacate the deed. The consideration may be either a good or valuable one. A good consideration is that of blood, or of natural love or affection, as when a man grants an estate to some of his own family, or a near relation. The law regards such a grant as founded on motives of generosity, prudence and natural duty. A valuable consideration is that of money, marriage or the like, which is an equivalent for the grant, and is founded on motives of justice.

A deed, too, must be written or printed, and it may be in any character or language, but it must be upon paper or parchment. It is no deed if written on stone, linen, leather, board or the like. Writing on paper or parchment may be less durable than upon stone or wood, and more liable to erasures than if written upon linen, but it is the law coming down to us through the long line of the centuries, that unless the writing be upon paper or parchment, it is not a deed of conveyance within purview of the law. There was a time when many conveyances were made by parol, or word of mouth only, without even a memorandum in writing, but this gave opportunity for such a variety of frauds, that centuries ago the English Parliament enacted a statute declaring that all such conveyances should have no greater force than a lease or an estate of will, and to-day I know of no nation recognizing parol sales of land as good and binding in law.

A deed also should be signed and acknowledged by the parties making it, sealed and delivered as the solemn act of the parties, to the party purchasing, and placed upon the records in the proper office prescribed for the recording of deeds in the county where the property is situated.

But, as the subject assigned me relates to what a farm deed includes, the foregoing may suffice for the proper introduction of my subject. If the farmer or whoever he may be, when he desires to purchase a property, would consult his lawyer as to his title, and his deed, in the same spirit and with the same intelligence he consults his physician, when he or a member of his family is sick, or as he consults his pastor when he needs spiritual consolation or direction for himself and family, he would in the end be the gainer and save himself much annoyance and often times needles litigation. Experience has proven too often, that the deed made by the "Squire" at the cross roads or in the village blacksmith shop, has been the cause of many a long and tedious law suit.

The simple rule of law is, that land in its legal signification has an indefinite extent upwards as well as downwards, "Cujus est Solum, Ejus est usque at Caleum." "He who owns the land, his it is, even to the sky," is the maxim of the law upwards; therefore, no man may erect any buildings or the like to overhang another's land; and downwards, whatever is in a direct line between the surface of any land and the center of the earth, belongs to the owner of the surface. So that the word land, means not only the surface of the earth, but everything over it, and under it; and therefore, if a man grants all his land, he thereby grants all his mines of metal and coal, his woods, his waters, and his houses, his oil and his gas, as well as his fields and his meadows. By the name of lands, therefore which is "Nomen Generalissimum," everything terrestrial will pass. So also a deed carries with it all the buildings belonging to the grantor, whether mentioned in the deed or not, and this includes the lumber or any timber of any old buildings which have been taken down or blown down and been packed away for future use on the farm; but if there be temporary buildings erected on the farm by a third party, with the consent of the owners, the deed would not convey these, as such buildings are personal property and do not belong to the land owners to convey. The real owner could move them off at his pleasure, even though the purchase of the farm thought he was buying all the buildings on the land. Everything fixed to the real estate by the owner of the land, with the intention of having it remain permanent, becomes part of the freehold, and in determining what are removable fixtures, the criterion is the intention to annex, not the character of the physical annexation to the realty. So it is with machinery which is a constituent part of a manufactory, for which the building has been adapted, and without which it would cease to be such manufactory; it is part of the freehold or reality, though not actually fastened to it. A house erected on the land of another becomes part of the reality. So, also, copper kettles in a brewery are part of the freehold. Burr millstones, rolls of an iron rolling mill, as well as the iron plates with which the floor is covered, and which are an indispensable part of it, though not manufactured for that purpose, are part of the realty, and pass by a sale thereof. Lightning rods, furnaces in the cellar, window-shutters, and mantelpieces attached permanently, and which could not be taken away without destroying the plastering, go with the house. Gas fixtures, such as chandeliers and side-brackets are mere personal property, and do not pass as fixtures by a sale of the real estate to which they are attached. Pumps, sinks, and watering troughs permanently fixed, and water pipes connected therewith bringing water from a distant spring, pass with the realty. Likewise passes with the realty a dinner bell attached to some building, and a cider mill and press in an orchard.

If there be any manure in the barn-yard, or in a compost heap on the field ready for immediate use, the buyer ordinarily, in the absence of any contrary agreement, takes that also as belonging to the farm; though if the owner had previously sold it to another party, and had collected it together in a heap, it would be otherwise; but a lessee of a farm cannot remove the manure made on the place while he was in occupation, though more be there than when he came.

Growing crops pass by the deed of a farm unless they are expressly reserved, and where it is not intended to convey them, it should be so stated in the deed. But if a tenant have a lease of the farm, he will be entitled to his share of the way-going crop. Standing trees pass with the realty; also trees blown down or cut down and still left in the woods where they fell; but if cut down and piled up into cordwood ready for sale, the wood becomes personal property, and does not pass by a sale of the realty.

Fences standing upon the farm, piles of hop poles stored away if once used upon the farm, pass with a sale of the realty, but new fencing material just bought and never attached to the soil, and loose poles or boards merely laid across the beams of the barn and never fastened to it, would not pass with a sale of the realty. It is the law in the State of New York, and in New Hampshire as well, that ornamental statutes and vases, etc., permanently erected and resting on the ground by their own weight, merely, pass by a sale of the realty, unless expressly reserved in the deed.

Time will not allow me to speak in detail of the general laws of purchase and sale of land, about which much may be said, but knowing what is included in the deed as to the property upon the surface of the land, an important inquiry is, as to how far the farm extends and to ascertain its proper boundaries. First, inquire as to the number of acres stated in the deed; second, the length of the boundary lines running around the farm, and third, the area inclosed within the described monuments, such as stakes, stones, trees, rocks or whatever may be described as corners of the farm. Whilst it is important that the number of acres stated in the deed are actually contained within the described boundaries, yet this is the weakest means of knowing the real extent of the farm, especially if the deed contains (as so many of them do), the words more or less. If a farm is bought for a given price, no action could be maintained against the seller for deficiency in the number of acres expressed in the deed, unless it clearly appeared that the land was bought at so much per acre. The length of the boundary lines running around the farm are very necessary to be correctly ascertained and known, and the deed should set-forth clearly and accurately, the distance from the various points marked upon the land; but this is not the most important, or controlling feature. The number of acres enclosed within the described monuments is by far the most important, and in case any dispute arise or any difference between them, controls all the rest.

If the boundary lines are described as beginning at a certain tree, or stones, or whatever it may be, thence to a particular rock, tree, stump or monument, and so on around the farm, the deed conveys all the land between inside those monuments, no matter what the deed calls for in number of acres, whether it be more or less. The monuments or marks should be fixed and definite, because they control the side lines of the farm, and if removed or tampered with by some designing person, they should be speedily replaced and kept permanent in their position. It matters not to the purchaser whether the seller represented that the boundaries contained more acres than he afterwards found out he had actually gotten, because he has no legal redress; but where a fraudulent statement of the boundaries is made, it would release the purchaser from the sale, although the farm contained as many, or even more acres than the parties called it in making the bargain. Hence, the all important inquiry to make at the time of purchasing, is to have the monument or marks definitely and accurately fixed, and it necessarily follows that the deed includes all the land inclosed by those monuments. The boundary line, too, if described in the deed as running to a tree, stump or rock, it ordinarily goes to the center of the object. If the line is described as running along a wall or fence, it passes along the middle of it, and as is the custom in our State, line fences are built fairly on the described line, even though it be a worm or "Virgina" fence, as it is sometimes called.

If the farm bounds by or on a river, creek, brook, rivulet, or stream of any kind, it usually extends to the middle of the current, not always to the middle of the water, but to the thread of the stream. Sometimes a farm is bounded on a mill-pond, a reservoir, or an artificial pond through which a current clearly makes its way, and in this case the farmer owns to the center of the current. If, however, the land in bounded by a lake or a vast natural pond, the line stops at the low water mark on the shore and does not extend into the pond. This construction is founded on the principal that the public have rights of navigation, sailing, fishing and the like on large streams of water. As to lands bounding on the sea-shore, some peculiar provisions exist, but as no Pennsylvania farm can be bounded by the sea, it is of but little moment whether this part of my subject secures much attention.

In the State of Massachusetts, if a deed describes the land as bounded "by the sea," "by the salt water" bay, harbor, cove, creek, stream or tide water, it generally includes the whole flats down to low water mark (if not over 100 rods), including the exclusive right to gather the sea weed or other such thing washed up thereon by the tide. On the other hand, if the deed bounds by the sea-shore, strand, beach or cliff, it extends only to high water mark, and gives no rights to the flats. The strip of land between high and low water mark, termed "the flats" has been a subject of much contention, and the question is often raised as to whom it belongs, whether to the owner of the upland or to the public.

Many nice and subtle decisions have been made, perhaps formed on better reasons than are apparent, which might be termed what we call the "niceties" of the law, but in the midst of them all, one is tempted to exclaim with the Earl of Warwick, in Shakespeare's Henry the VI:

"Between two hawks, which flies the higher pitch;
Between two dogs which hath the deeper mouth;
Between two horses, which doth bear him best;
Between two girls, which hath the merriest eye;
I have perhaps some shallow spirit of judgment;
But in these nice sharp "quitlets" of the law,
Good faith, I am no wiser than a daw."

LIST OF COUNTY AND LOCAL AGRICULTURAL SOCIETIES.

With Names and Addresses of Secretaries and Dates for Holding Fall Exhibitions of 1894, compiled from official reports and sources by the Pennsylvania Board of Agriculture.

[Those marked with an * are represented in the Board of Agriculture by elected members.]

COUNTY.	Corporate Name of Society.	Name and Address of Secretary.	Where held.	When held.
	PENNSYLVANIA STATE AGRICULTURAL SOCIETY,	J. Schall Wilhelm, Harrisburg,	Meadville,	Sept. 3-8.
	STATE HORTICULTURAL ASSOCIATION,	E. B. Engle, Waynesboro',	Holds no fair,	No fair.
	GRANGERS' INTERSTATE EXPOSITION,	R. H. Thomas, Mechanicsburg,	Williams' Grove,	Aug. 27-Sept. 1.
	MT. GRETNA FARMERS' ENCAMPM'T & INDUST'L EX.,	Dr. S. P. Heilman, Heilmandale,	Mt. Gretna,	Aug. 20-25.
	PATRONS OF HUSBANDRY EXHIBITION,	L. Rhone, Centre Hall,	Centre Hall,	Sept. 17-22.
	CONNEAUT LAKE EXPOSITION,	Col. Frank Mantor, M'g'r, Exposition Park,	Exposition Park,	Aug. 27-Sept. 1.
Adams,*	Adams County Agricultural Association,	D. Toot, Table Rock,		Holds no fair.
Allegheny,*	Tarentum Agricultural and Driving Park Association,	J. C. Dunn, Tarentum,	Tarentum,	Aug. 28-31.
Armstrong,*	Dayton Agricultural and Mechanical Association,	E. Morrow, Dayton,	Dayton,	Sept. 25-28.
Do.	Parker Agricultural Association,	R. Balf, Parker's Landing,	Parker,	Sept. 11-14.
Beaver,*	Beaver County Agricultural Society,	J. C. Martin, Beaver,	Beaver,	Sept. 25-28.
Do.	Mill Creek Valley Agricultural Society,	R. M. Swaney, Hookstown,	Hookstown,	Aug. 15-17.
Bedford,*	Bedford County Agricultural Society,	B. F. Harclerode, Bedford,	Bedford,	Sept. 25-28.
Berks,*	Berks County Agricultural and Horticultural Society,	Cyrus T. Fox, Reading,	Reading,	Oct. 2-5.
Do.	Keystone Agricultural Society,	J. B. Esser, Kutztown,	Kutztown,	Sept. 18-21.
Blair,*	Blair County Agricultural Society,	C. H. Porter, Hollidaysburg,	Hollidaysburg,	No fair.
Bradford,*	Bradford County Agricultural Society,	J. N. Califf, Towanda,	East Towanda,	Sept. 25-28.
Do.	Union Agricultural Association,	C. D. Derrah, Canton,	Canton,	Sept. 18-21.
Do.	Troy Farmers' Club,	J. R. Vannoy, East Troy,	Troy,	Sept. 11-14.
Butler,*	Butler County Agricultural Society,	Ira McJunkin, Butler,	Butler,	Sept. 4-7.
Cambria,*	Cambria County Agricultural Association,	J. V. Mancher, Carrolltown,	Carrolltown,	Sept. 25-28.
Cameron,*	Cameron County Agricultural Association,	H. G. Lyons, Emporium,		No fair.
Carbon,*	Carbon County Industrial Society,	E. Bauer, East Mauch Chunk,	Lehighton,	Oct. 2-5.
Centre,*	Centre County Agricultural Society,	John Kline, Howard,	Bellefonte,	No fair.
Chester,*	Chester County Agricultural Society,	B. Lear, West Chester,	West Chester,	Aug. 30-Sept. 1.
Do.	Oxford Agricultural Society,	C. P. Martindale, Oxford,	Oxford,	Sept. 26-28.
Clarion,*	Clarion County Agricultural Society,	J. H. Patrick, Clarion,	Clarion,	Sept. 17-20.
Clearfield,*	Clearfield County Agricultural Society,	Matt Savage, Clearfield,	Clearfield,	No fair.
Clinton,*	Clinton County Agricultural Society,	J. R. Porter, Mackeyville,	Cedar Springs,	No fair.
Columbia,*	Columbia County Agricultural Society,	A. N. Yost, Bloomsburg,	Bloomsburg,	Oct. 9-13.
Do.	Northern Columbia and Southern Luzerne Agricultural Society,	J. G. Jacoby, Berwick,	Berwick,	Oct. 3-6.

LIST OF COUNTY AND LOCAL AGRICULTURAL SOCIETIES—Continued.

COUNTY.	Corporate Name of Society.	Name and Address of Secretary.	Where held.	When held.
Crawford,*	Crawford County Agricultural Society,	J. E. Rupert, Conneautville,	Conneautville,	Oct. 2-5.
Do.	Cochranton Agricultural Society,	J. H. Adams, Cochranton,	Cochranton,	Oct. 2-4.
Do.	Oil Creek Valley Agricultural Association,	C. M. Hayes, Titusville,	Titusville,	Oct. 2-5.
Do.	Central Crawford Agricultural Society,	H. E. Carrigan, Cambridge,	Cambridgeboro,	Sept. 18-21.
Cumberland,*	Cumberland County Agricultural Society,	W. H. McCrea, Carlisle,	Carlisle,	Sept. 25-28.
Dauphin,	Gratz, Driving Park and Agricultural Society,	J. W. Hoffman, Gratz,	Gratz,	Sept. 18-21.
Do.*	Agricultural Society of Dauphin County,	G. Hiester, Harrisburg,	Harrisburg,	No fair.
Do.	Lykens Driving Park and Agricultural Society,	A. C. Long, Lykens,	Lykens,	Aug. 21-24.
Delaware,*	Delaware County Agricultural Society,	Joseph Pennell, Middletown,		No fair.
Erie,*	North Western Agricultural Society,	J. D. Bentley, Corry,	Corry,	Sept. 11-14.
Do.	Wattsburg Agricultural Society,	A. S. Phelps, Wattsburg,	Wattsburg,	Sept. 4-7.
Do.	Edinboro' Agricultural Society,	J. J. McWilliams, Edinboro,	Edinboro,	Sept. 11-14.
Fayette,*	Fayette County Agricultural Association,	Wm. W. Parshall, Uniontown,	Uniontown,	Aug. 21-24.
Franklin,*	Franklin County Farmers' Association,	D. Z. Shook, Greencastle,	Greencastle,	No fair.
Fulton,*	Big Cove Agricultural Society,	W. C. Patterson, McConnellsburg,	McConnellsburg,	No fair.
Greene,	Greene County Agricultural Society,	J. L. Clawson, Carmichaels,	Carmichaels,	Sept. 27-28.
Do.*	Waynesburg Central Agricultural Society,	J. T. Rogers, Waynesburg,	Waynesburg,	Sept. 18-20.
Huntingdon,*	Huntingdon County Agricultural Society,	W. A. Neff, Warriors' Mark,	Warriors' Mark,	No fair.
Indiana,*	Indiana County Agricultural Society,	John S. Taylor, Indiana,	Indiana,	Sept. 10-14.
Jefferson,*	Jefferson County Agricultural Association,	S. H. Whitehill, Brookville,	Brookville,	Sept. 25-28.
Do.	Punxsutawney Agricultural Association,	H. W. Mundorff, Punxsutawney,	Punxsutawney,	No report.
Juniata,*	Juniata County Agricultural Society,	W. R. Wharton, Port Royal,	Port Royal,	Sept. 12-14.
Lackawanna,*	North Abington and Glenburn Farmers' Club,	Isaac Ellis, Glenburn,	Glenburn,	No fair.
Do.	North Lackawanna Farmers' Association,	J. L. Stone, Waverly,	Waverly,	No fair.
Lancaster,*	Lancaster County Agricultural Society,	F. R. Diffenderffer, Lancaster,	Lancaster,	Holds no fair.
Do.	National Fair Association,	J. Schall, Wilheim, Harrisburg,	Lancaster,	Sept. 24-29.
Lawrence,*	Lawrence County Agricultural Society,	H. W. Grigsby, New Castle,	New Castle,	Aug. 28-31.
Lehigh,*	Lehigh County Agricultural Society,	L. P. Hecker, Allentown,	Allentown,	Sept. 25 28.
Luzerne,*	Dallas Union Agricultural Society,	J. H. Anderson, Dallas,	Dallas,	Oct. 2-5.
Lycoming,*	Muncy Valley Farmers' Club,	J. A. S. Ball, Hughesville,	Hughesville,	Sept. 26-29.
McKean,	McKean County Agricultural Society,	C. W. Catlin, Port Allegheny,	Port Allegany,	No report.
Do.*	Agricultural and Breeders' Society,	M. N. Allen, East Smethport,		No fair.
Mercer,	Mercer County Agricultural Society,	J. P. Hines, Stoneboro,	Stoneboro,	Sept. 25-28.
Do.*	Mercer Central Agricultural Society,	J. P. Orr, Mercer,	Mercer,	Sept. 12-14.
Mifflin,*	Agricultural and Poultry Society,	A. T. Hamilton, Lewistown,	Lewistown,	Dec. 4-6.

Monroe,*	Monroe County Agricultural Society,	T. C. Brown, Stroudsburg,	Stroudsburg,	Sept. 4-8.
Montgomery,*	Montgomery, Berks and Chester Agricultural Society,	E. P. Ancona, Pottstown,	Pottstown,	Sept. 11-14.
Montour,*	Montour County Agricultural Society,	W. K. West, Danville,	Danville,	Sept. 19-21.
Do.	Northern Montour Agricultural Society,	C. E. Shires, Washingtonville,	Washingtonville,	No fair.
Northampton,*	Northampton County Agricultural Society,	J. J. Maus, Nazareth,	Nazareth,	Oct. 2-5.
Do.	Farmers' and Mechanics' Institute,	T. H. Hay, Easton,	Easton,	Not selected.
Do.	Bethlehem Fair and Driving Park Association,	H. A. Groman, Bethlehem,	Bethlehem,	Sept. 18-22.
Northumberland,*	Milton Driving Park and Fair Association,	W. P. Hastings, Milton,	Milton,	Oct. 2-4.
Do.	Shamokin Agricultural and Driving Park Association,	A. G. Marr, Shamokin,	Shamokin,	No fair.
Perry,*	Perry County Agricultural Society,	F. A. Fry, Newport,	Newport,	Sept. 18-21.
Potter,	Potter County Agricultural and Horticultural Society,	C. E. Larrabee, Coudersport,	Coudersport,	Sept. 11-13.
Do.*	Farmers' and Breeders' Association,	D. S. Lisbert, Coudersport,		No fair.
Schuylkill,*	Schuylkill County Agricultural Society,	G. H. Yeager, Orwigsburg,	Orwigsburg,	Sept 11-14.
Do.	Ringtown Agricultural Society,	I. Applegate, Shenandoah,	Ringtown,	Sept. 5-7.
Do.	Mahanoy Valley Agricultural Association,	Frank Rentz, Ashland,	Lavelle,	Sept. 18-21.
Snyder,*	Snyder County Agricultural Association,	H. A. Klingler, Freeburg,		No fair.
Sullivan,*	Sullivan County Agricultural Society,	A. G. Little, Dushore,	Forksville,	Oct. 3-6.
Susquehanna,*	Susquehanna County Agricultural Society,	W. A. Titsworth, Montrose,	Montrose,	Oct. 2-3.
Do.	Harford Agricultural Society,	E. E. Jones, Harford,	Harford,	Sept. 26-27.
Tioga,	Cowanesque Valley Agricultural Society,	Chas. C. Williams, Westfield,	Westfield,	Sept. 17-21.
Do.*	Tioga County Agricultural and Mechanical Industrial Ass'n,	J. A. Elliott, Mansfield,	Mansfield,	Sept. 25-28.
Do.	Tioga County Pomona Grange,	O. S. Kimball, Westfield,	Wellsboro,	Sept. 5-7.
Union,*	Union County Agricultural Society,	G. E. Long, Lewisburg,	Lewisburg,	Sept. 25-28.
Venango,*	Venango County Agricultural Society,	J. Miller, Franklin,	Franklin,	No fair.
Warren,*	Warren County Fair Association,	W. H. Taylor, Warren,	Warren,	Aug. 28-31.
Washington,*	Western Pennsylvania Agricultural Association,	J. Le Moyne, Washington,	Washington,	Aug. 28-31.
Do.	Union Agricultural Association,	W. Melvin, Burgettstown,	Burgettstown,	Oct. 2-4.
Wayne,*	Wayne County Agricultural Society,	W. M. Gardner, Honesdale,	Honesdale,	Sept. 25-27.
Westmoreland,*	Westmoreland County Agricultural Society,	M. N. Clark, Claridge,	Greensburg,	Sept. 4-7.
Wyoming,*	Wyoming County Agricultural Society,	R. J. Bardwell, Tunkhannock,	Tunkhannock,	Sept. 19-21.
York,*	York County Agricultural Society,	E. Chapin, York,	York,	Oct. 1-5.
Do.	Hanover Agricultural Society,	M. O. Smith, Hanover,	Hanover,	Sept. 11-14.

LIST OF LOCAL FARMERS' INSTITUTES.

Held from June 1, 1893, to June 1, 1894.

COUNTIES.	Location.	Date.		Managed by.
1. Adams,	Arendtsvile,	January	9-10,	I. Garretson, Biglerville.
2. Adams,	York Springs,	January	11-12,	I. Garretson, Biglerville.
3. Allegheny,	Bakerstown,	February	27-28,	W. H. McCullough, Tarentum.
4. Allegheny,	Oakdale,	March	1-2,	W. H. McCullough, Tarentum.
5. Armstrong,	Kittanning,	October	11-12,	D. W. Lawson, Dayton.
6. Armstrong,	Dayton,	December	22-23,	D. W. Lawson, Dayton.
7. Armstrong,	Middlesex,	March	21-22,	D. W. Lawson, Dayton.
8. Beaver,	New Sheffield,	March	21,	E. S. Weyand, Beaver.
9. Bedford,	New Paris,	February	20-21,	S. S. Diehl, Bedford.
10. Bedford,	Loysburg,	February	27-28,	S. S. Diehl, Bedford.
11. Berks,	Joanna Heights,	September	29-30,	George D. Stitzel, Reading.
12. Berks,	Fleetwood,	December	13-14,	George D. Stitzel, Reading.
13. Bradford,	Le Raysville,	December	5-6,	Louis Piolett, Wysox.
14. Bradford,	Canton,	December	7-8,	Louis Piolett, Wysox.
15. Bradford,	Towanda,	March	28-29,	Louis Piolett, Wysox.
16. Bucks,	Richboro,	December	19-20,	E. Reeder, New Hope.
17. Bucks,	Doylestown,	February	15-16,	E. Reeder, New Hope.
18. Butler,	Butler,	December	1-2,	W. H. H. Riddle, Butler.
19. Butler,	Slippery Rock,	March	1-2,	W. H. H. Riddle, Butler.
20. Cambria,	Carrolltown,	June	20-21,	J. J. Thomas, Carrolltown,
21. Carbon,	Weatherly,	November	2,	G. T. Wells, Rockport.
22. Carbon,	New Mahoning,	November	3,	G. T. Wells, Rockport.
23. Centre,	Rebersburg,	February	20-21,	J. A. Woodward, Howard.
24. Centre,	Howard,	February	22-23,	J. A. Woodward, Howard.
25. Chester,	Unionville,	February	22-23,	Dr. J. P. Edge, Downingtown.
26. Chester,	Oxford,	January	16-17,	Dr. J. P. Edge, Downingtown.
27. Chester,	Atglen,	January	18-19,	Dr. J. P. Edge, Downingtown.
28. Chester,	Avondale,	February	21,	Dr. J. P. Edge, Downingtown.
29. Chester,	Chatham,	February	21,	Dr. J. P. Edge, Downingtown.
30. Chester,	Kennett Square,	February	22-23,	Dr. J. P. Edge, Downingtown.
31. Chester,	Phoenixville,	March	16-17,	Dr. J. P. Edge, Downingtown.
32. Clarion,	Clarion,	December	4-5,	W. Shanafelt, Brinkerton.
33. Clarion,	Sligo,	December	6-7,	W. Shanafelt, Brinkerton.

34. Clarion,	New Bethlehem,	February	14-15,	W. Shanafelt, Brinkerton.
35. Clearfield,	Clearfield,	December	14-15,	E. M. Davis, Grampian.
36. Clearfield,	Dubois,	December	15-16,	E. M. Davis, Grampian.
37. Clearfield,	Utahville,	February,	16-17,	E. M. Davis, Grampian.
38. Clinton,	Lock Haven,	December	12-13,	Joel A. Herr, Cedar Springs.
39. Clinton,	Mackeyville,	February	16-17,	Joel A. Herr, Cedar Springs.
40. Columbia,	Millville,	Feb. 28, March	1,	Chandlee Eves, Millville.
41. Columbia.	Bloomsburg,	March	2-3,	Chandlee Eves, Millville.
42. Crawford,	Guys' Mill,	December	12-13,	Luther Gates, Beaver Center.
43. Crawford,	Spartansburg,	January	4-5,	Luther Gates, Beaver Center.
44. Crawford,	Springboro',	February	15-16,	Luther Gates, Beaver Center.
45. Cumberland,	Shippensburg,	February	6-7,	Chas. H. Mullin, Mt. Holly Springs.
46. Cumberland,	Mechanicsburg,	February	26-27,	Chas. H. Mullin, Mt. Holly Springs.
47. Dauphin,	Gratz,	December	8-9,	G. Hiester, Harrisburg.
48. Dauphin,	Harrisburg,	January	24-25,	
49. Delaware,	Concordville,	November	15-16,	Geo. E. Heyburn, Chadds Ford.
50. Erie,	Union City,	January	2-3,	A. L. Wales, Corry.
51. Erie,	Edinboro',	February	13-14,	A. L. Wales, Corry.
52. Erie,	Lake Pleasant,	March	23,	A. L. Wales, Corry.
53. Fayette,	Uniontown,	December	22-23,	G. Hopwood, Uniontown.
54. Fayette,	Connellsville,	February	24-25,	G. Hopwood, Uniontown.
55. Fayette,	Fairview,	February	16-17,	G. Hopwood, Uniontown.
56. Franklin,	Greencastle,	December	20-21,	D. Z. Shook, Greencastle.
57. Fulton,	McConnellsburg,	October	25-26,	D. H. Patterson, Webster Mills.
58. Fulton,	McConnellsburg,	February	15-16,	D. H. Patterson, Webster Mills.
59. Greene,	Graysville,	November	21,	B. F. Herrington, Waynesburg.
60. Greene,	Waynesburg,	November	22,	B. F. Herrington, Waynesburg.
61. Greene,	Carmichaels',	November	23,	B. F. Herrington, Waynesburg.
62. Huntingdon,	Warriors' Mark,	January	30-31,	G. W. Musser, Fillmore.
63. Huntingdon,	Markelsburg,	March	9-10,	G. W. Musser, Fillmore.
64. Indiana,	Plumville,	January	16-17,	N. Seanor, Plumville.
65. Indiana,	Indiana,	January	18-19,	N. Seanor, Plumville.
66. Indiana,	Saltsburg,	March	19-20,	N. Seanor, Plumville.
67. Jefferson,	Belleview,	December	8-9,	J. McCracken, Jr., Frostburg.
68. Jefferson,	Sandy Lake,	December	11-12,	J. McCracken, Jr., Frostburg.
69. Jefferson,	Punxsutawney,	December	13-14,	J. McCracken, Jr., Frostburg.
70. Juniata,	McAllisterville,	February	13-14,	D. E. Robison, Port Royal.
71. Juniata,	East Waterford,	February	15-16,	D. E. Robison, Port Royal.
72. Lackawanna,	Dalton,	December	19-20	H. H. Colvin, Dalton.
73. Lackawanna,	Moscow,	December	21-22,	H. H. Colvin, Dalton.
74. Lackawanna,	Tompkinsville,	January	26-27,	H. H. Colvin, Dalton.
75. Lancaster,	Black Barren Springs,	September	6-7,	Calvin Cooper, Bird-in-Hand.

LIST OF LOCAL FARMERS' INSTITUTES—Continued.

COUNTIES.	Location.	Date.	Managed by
76. Lancaster,	Rutland Park,	September 8,	Calvin Cooper, Bird-in-Hand.
77. Lancaster,	Rocky Springs,	September 9,	Calvin Cooper, Bird-in-Hand.
78. Lancaster,	Mount Joy,	February 8,	Calvin Cooper, Bird-in-Hand.
79. Lancaster,	Quarryville,	February 8-9,	Calvin Cooper, Bird-in-Hand.
80. Lancaster,	Christiana,	February 9-10,	Calvin Cooper, Bird-in-Hand.
81. Lawrence,	New Castle,	November 27-28,	S. McCreary, Neshannock Falls.
82. Lawrence,	Plain Grove,	February 22-23,	S. McCreary, Neshannock Falls.
83. Lebanon,	Lebanon,	December 29-30,	C. R. Lantz, Lebanon.
84. Lehigh,	Macungie,	February 22-23,	Dr. J. P. Barnes, Allentown.
85. Luzerne,	Dallas,	January 11-12,	W. P Kirkendall, Dallas.
86. Luzerne,	Huntington Mills,	January 19-20,	W. P. Kirkendall, Dallas.
87. Lycoming,	Hughesville,	December 14-15,	A. Fague, Picture Rocks.
88. Lycoming,	Montgomery,	February 26-27,	A. Fague, Picture Rocks.
89. Mercer,	Greenville,	November 29-30,	Robert McKee, Mercer.
90. Mercer,	Mercer,	March 9-10,	Robert McKee, Mercer.
91. Mercer,	Sandy Lake,	March 8,	Robert McKee, Mercer.
92. Mercer,	Fredonia,	April 10-11,	Robert McKee, Mercer.
93. Mifflin,	Lewistown,	January 19-20,	J. B. Shannon, Lewistown.
94. Monroe,	Stroudsburg,	January 16-17,	Randall Bisbing, Minsi.
95. Monroe,	Brodheadsville,	February 22-23,	Randall Bisbing, Minsi.
96. Montgomery,	Hatboro',	December 13-14,	Jason Sexton, Spring House.
97. Montgomery,	Norristown,	February 13-14,	Jason Sexton, Spring House.
98. Montour,	Washingtonville,	February 6-7,	T. L. Clapp, Limestoneville.
99. Montour,	Exchange,	December 8,	T. L. Clapp, Limestoneville.
100. Northampton,	Nazareth,	February 20-21,	B. B. McClure, Bath.
101. Northampton,	Bethlehem,	June 14-15,	
102. Northumberland,	Northumberland,	March 5-6,	John Hoffa, Milton.
103. Northumberland,	Milton,	March 7-8,	John Hoffa, Milton.
104. Northumberland,	Turbotville,	March 9-10,	John Hoffa, Milton.
105. Perry,	Blain,	December 12-13,	D. Kistler, Kistler.
106. Perry,	Millerstown,	January 9-10,	D. Kistler, Kistler.
107. Philadelphia,	Bustleton,	January 17-18,	J. B. Kirkbride, Bustleton.
108. Potter,	Ulysses,	April 19-20,	W. A. Gardner, Andrew's Settlem't
109. Schuylkill,	Pine Grove,	October 4-5,	W. H. Stout, Pine Grove.
110. Schuylkill,	Hegins,	January 31, Feb. 1,	W. H. Stout, Pine Grove.

111. Snyder,	Beavertown,	November	28-29,	E. W. Tool, Freeburg.
112. Snyder,	Freeburg,	January	23-24,	E. W. Tool, Freeburg.
113. Somerset,	Somerset,	January	9-10,	N. B. Critchfield, Jenners' X roads
114. Sullivan,	Forksville,	February	8-9,	J. K. Bird, Millview.
115. Susquehanna,	New Milford,	November	20-21,	R. S. Searle, Montrose.
116. Susquehanna,	Jackson,	November	21-22,	R. S. Searle, Montrose.
117. Susquehanna,	Harford,	November	23-24,	R. S. Searle, Montrose.
118. Susquehanna,	Montrose,	January	30-31,	R. S. Searle, Montrose.
119. Tioga,	Mansfield,	January	16-17,	R. S. Searle, Montrose.
120. Tioga,	Knoxville,	January	18-19,	P. D. Rexford, Mansfield.
121. Union,	Lewisburg,	January	16-17,	J. A. Gundy, Lewisburg.
122. Union,	Hartleton,	January	18-19,	J. A. Gundy, Lewisburg.
123. Venango,	Clintonville,	December	14-15,	Porter Phipps, Kennerdell.
124. Venango,	Cooperstown,	February	22-23,	Porter Phipps, Kennerdell.
125. Warren,	Warren,	January	11-12,	Charles Lott, Warren.
126. Washington,	Burgettstown,	January	4-5,	John McDowell, Washington.
127. Wayne,	Lake Como,	January	16-17,	N. F. Underwood, Lake Como.
128. Wayne,	South Caanan,	January	18-19,	N. F. Underwood, Lake Como.
129. Westmoreland,	Mount Pleasant,	December	20-21,	W. C. Sloan, Sloan.
130. Westmoreland,	Markle,	November	27-28,	W. C. Sloan, Sloan.
131. Westmoreland,	Greensburg,	November	29-30,	W. C. Sloan, Sloan.
132. Westmoreland,	Manor Station,	March	13,	W. C. Sloan, Sloan.
133. Wyoming,	Tunkhannock,	February	13-14,	N. G. Bunnell, Vosburg.
134. York,	Red Lion,	December	26-27,	Dr. W. S. Roland, York.
135. York,	York,	December	28-29,	Dr. W. S. Roland, York.
136. York,	Hellam,	February	1-2,	Dr. W. S. Roland, York.
137. York,	Dillsburg,	January	29-30,	Dr. W. S. Roland, York.
138. York,	Delta,	March	6-7,	Dr. W. S. Roland, York.

SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN DURING THE YEAR 1894 AT THE OFFICE OF THE WEATHER BUREAU, UNITED STATES DEPARTMENT OF AGRICULTURE, HARRISBURG, DAUPHIN COUNTY, PENNSYLVANIA—377 FEET ABOVE SEA LEVEL.

BY MAJOR FRANK RIDGWAY, *Observer United States Weather Bureau and Meteorologist of the Board of Agriculture.*

	Average pressure of atmosphere by barometer in inches and tenths.	Temperature.			Precipitation.		Weather.		
		Highest.	Lowest.	Average.	In inches and hundredths.	Days with rain or snow.	Clear.	Partly cloudy.	Cloudy.
January,	30.20	54	15	33	1.77	12	8	14	9
February,	30.17	51	3	29	4.56	13	6	8	14
March,	30.13	75	19	44	1.30	8	13	9	9
April,	30.07	76	27	50	2.27	11	12	5	13
May,	29.96	84	42	62	6 07	19	11	7	13
June	30.01	95	47	71	3.25	12	10	13	7
July,	30.02	96	52	76	1.89	6	17	9	5
August,	30.03	90	54	71	4.08	9	9	12	10
September,	30.11	88	40	68	5.53	9	11	8	11
October,	30 03	81	36	55	4.60	9	10	11	10
November,	30.14	67	23	40	1.90	7	10	10	10
December,	30.18	55	4	34	3.84	13	9	13	9
Total,	....	......	......	......	......	128	126	119	120

Highest barometer pressure, 30.84, February 24, 1894.
Lowest barometer pressure, 29.48, December 27, 1894.
Highest temperature, 96°, July 20, 1894.
Lowest temperature, 3°, February 25, 1894.
Total snowfall during the year, 54.00 inches.
Rain or melted snow, 1888, 41.74 inches.
Rain or melted snow, 1889, 50.07 inches.
Rain or melted snow, 1890, 42.63 inches.
Rain or melted snow, 1891, 43.40 inches.
Rain or melted snow, 1892, 39.65 inches.
Rain or melted snow, 1893, 35.18 inches.
Rain or melted snow, 1894, 40.56 inches.
All barometer readings corrected to sea level.

There has been an accumulated excess in temperature during the year of 1894, of five hundred and twenty-one degrees (521°), an accumulated deficiency in precipitation of 6.17 inches.

COMPARATIVE VALUE OF FARMS IN PENNSYLVANIA, 1850 TO 1890, INCLUSIVE.

COUNTIES.	Cash value of farms in 1850.	Cash value of farms in 1860.	Cash value of farms in 1870.	Cash value of farms in 1880.	Cash value of farms in 1890.
Adams,	$6,390,056	$9,339,119	$14,611,060	$14,386,576	$11,702,920
Allegheny,	17,952,830	25,394,395	56,448,818	40,411,956	47,079,330
Armstrong,	3,663,903	6,253,459	13,681,426	13,577,665	12,376,767
Beaver,	5,331,172	7,858,586	14,198,713	12,596,009	13,707,310
Bedford,	3,962,047	6,324,760	9,495,119	9,975,163	9,223,864
Berks,	21,429,502	26,516,391	43,638,465	36,989,274	33,375,610
Blair,	3,869,205	4,995,315	8,098,146	8,895,772	6,732,620
Bradford,	8,293,689	13,459,225	25,158,245	22,916,557	20,171,450
Bucks,	18,555,583	28,766,280	40,289,213	36,151,958	30,489,270
Butler,	5,012,491	9,604,550	18,230,848	20,644,143	20,056,385
Cambria,	1,352,343	2,827,438	4,834,076	6,213,058	6,852,230
Cameron,	......	......	1,332,188	609,820	677,010
Carbon,	488,200	929,170	1,484,210	2,487,175	2,708,820
Centre,	5,024,563	7,073,465	13,565,198	12,634,448	9,058,030
Chester,	25,425,957	37,243,640	46,737,688	39,217,513	36,683,210
Clarion,	2,779,989	5,205,455	7,784,127	10,375,428	9,284,110
Clearfield,	1,718,869	3,578,785	5,931,360	8,088,943	9,247,540
Clinton,	2,028,610	3,343,203	4,797,040	5,304,751	4,458,720
Columbia,	3,254,346	5,085,413	9,015,460	7,893,876	7,414,020
Crawford,	5,058,629	11,726,962	21,905,661	21,200,940	22,861,815
Cumberland,	8,748,133	15,645,317	22,474,577	19,776,980	16,225,440
Dauphin,	7,175,872	13,000,746	19,053,433	15,974,915	15,182,470
Delaware,	8,873,456	14,795,210	19,288,727	18,437,510	15,136,170
Elk,	286,772	676,750	1,019,820	1,450,588	1,346,670
Erie,	5,782,858	14,114,964	23,991,607	21,613,613	21,031,100
Fayette,	7,369,275	9,794,617	18,250,958	20,270,434	19,795,250
Forest,	......	343,912	619,398	603,490	963,530
Franklin,	11,911,072	16,265,894	23,775,174	19,542,673	16,782,370
Fulton,	1,145,960	1,725,609	2,565,042	2,486,621	2,237,545
Greene,	4,447,781	7,442,626	13,554,374	13,748,657	15,652,320
Huntingdon,	5,147,005	6,570,952	9,445,678	8,936,461	7,410,865
Indiana,	3,118,954	6,847,960	12,945,069	13,553,842	15,068,660
Jefferson,	1,307,096	2,994,868	5,362,623	7,311,371	8,401,270
Juniata,	2,617,450	3,448,455	6,351,175	6,314,374	5,116,270
Lancaster,	35,454,432	52,599,461	70,724,908	69,004,919	58,860,690
Lackawanna,	......	......	......	6,343,348	6,426,950
Lawrence,	3,942,890	6,831,599	11,614,044	12,040,772	10,698,130
Lebanon,	7,085,000	11,289,394	19,016,808	17,146,608	14,014,780
Lehigh,	9,913,608	15,518,918	23,555,476	17,977,977	16,462,840
Luzerne,	6,100,255	12,497,545	21,565,724	12,695,779	10,164,780
Lycoming,	4,110,234	7,472,791	11,212,366	12,833,435	13,366,710
McKean,	276,820	1,441,361	1,566,250	3,424,549	3,559,160
Mercer,	4,793,787	9,022,237	22,048,299	20,414,614	18,505,350
Mifflin,	4,149,675	6,777,256	9,133,277	8,013,471	6,396,670
Monroe,	2,000,743	2,861,730	4,459,114	5,095,275	4,304,660
Montgomery,	20,290,748	29,564,665	40,902,050	36,688,601	39,617,880
Montour,	2,614,949	2,703,853	4,615,655	3,783,609	3,516,940
Northampton,	2,535,675	14,259,635	20,991,169	18,405,888	15,837,360
Northumberland,	5,766,803	8,085,626	12,430,987	11,006,245	10,180,840
Perry,	3,317,790	5,494,933	8,750,895	8,478,217	6,949,730
Philadelphia,	13,659,960	26,277,400	18,945,000	13,633,460	15,630,770
Pike,	959,200	1,639,070	2,213,325	2,391,693	2,721,900
Potter,	730,986	1,776,291	2,942,348	4,341,945	5,331,650
Schuylkill,	3,097,598	7,024,544	8,643,655	9,829,814	9,536,640
Snyder,	......	3,911,110	5,769,403	6,061,330	5,305,660
Somerset,	3,874,520	8,764,526	12,043,715	11,858,391	11,726,250
Sullivan,	314,155	851,328	1,658,109	2,174,096	2,300,140
Susquehanna,	5,382,470	6,115,268	16,707,011	13,479,029	12,458,160
Tioga,	3,404,497	6,246,289	10,923,925	13,550,131	13,501,522
Union,	5,800,718	4,949,388	7,891,977	7,705,281	6,873,970
Venango,	2,149,597	5,375,713	7,211,006	7,956,538	8,134,680
Warren,	1,593,186	3,378,135	6,976,674	7,719,618	7,006,540
Washington,	14,943,098	20,937,686	39,015,006	35,284,957	34,093,540
Wayne,	2,188,166	6,410,780	8,816,220	8,392,507	8,423,470
Westmoreland,	12,576,343	16,036,203	28,210,826	30,550,823	33,481,515
Wyoming,	1,628,580	3,247,140	6,633,160	5,671,915	5,429,380
York,	13,695,948	23,495,341	36,358,484	31,142,021	26,908,015

Total value in 1850,	$407,876,099
Total value in 1860,	662,050,707
Total value in 1870,	1,043,481,582
Total value in 1880,	975,689,410
Total value in 1890,	922,240,233

FEEDING STANDARDS.

(A table alluded to by Dr. H. P. Armsby, in addresses before the Board of Agriculture and Farmers' Institutes. Taken from the annual report of the Pennsylvania State College for 1893.)

PER DAY AND PER 1,000 POUNDS LIVE WEIGHT.

		Total organic substance.	Nutritive (Digestible) Substances.			Total nutritive substance.	Nutritive ratio.
			Protein.	Carbhydrates.	Fat.		
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1. Oxen at rest in stall,		17.5	0.7	8.0	0.15	8.85	1 : 12.0
2. Wool sheep, coarser breeds,		20.0	1.2	10.3	0.20	11.70	1 : 9.0
Wool sheep finer breeds,		22.5	1.5	11.4	0.25	13.15	1 : 8.0
3. Oxen moderately worked,		24.0	1.6	11.3	0.30	13.20	1 : 7.5
Oxen heavily worked,		26.0	2.4	13.2	0.50	16.10	1 : 6.0
4. Horses lightly worked,		20.0	1.5	9.5	0.40	11.40	1 : 7.0
Horses moderately worked,		21.0	1.7	10.4	0.60	12.70	1 : 7.0
Horses heavily worked,		23.0	2.3	12.5	0.80	15.60	1 : 6.0
5. Milk cows,		24.0	2.5	12.5	0.40	15.40	1 : 5.4
6. Fattening oxen, 1st period,		27.0	2.5	15.0	0.50	18.00	1 : 6.5
Fattening oxen, 2d period,		26.0	3.0	14.8	0.70	18.50	1 : 5.5
Fattening oxen, 3d period,		25.0	2.7	14.8	0.60	18.10	1 : 6.0
7. Fattening sheep, 1st period,		26.0	3.0	15.2	0.50	18.70	1 : 5.5
Fattening sheep, 2d period,		25.0	3.5	14.4	0.60	18.50	1 : 4.5
8. Fattening swine, 1st period,		36.0	5.0	27.5		32.50	1 : 5.5
Fattening swine, 2d period,		31.0	4.0	24.0		28.00	1 : 6.0
Fattening swine, 3d period,		23.5	2.7	17.5		20.20	1 : 6.5
9. Growing cattle:							
Age. Months.	*Average live weight per head.*						
2–3	150 lbs.,	22.0	4.0	13.8	2.0	19.8	1 : 4.7
3–6	300 lbs.,	23.4	3.2	13.5	1.0	17.7	1 : 5.0
6–12	500 lbs.,	24.0	2.5	13.5	0.6	16.6	1 : 6.0
12–18	700 lbs.,	24.0	2.0	13.0	0.4	15.4	1 : 7.0
18–24	850 lbs.,	24.0	1.6	12.0	0.3	13.9	1 : 8.0
10. Growing sheep:							
5–6	56 lbs.,	28.0	3.2	15.6	0.8	19.6	1 : 5.5
6–8	67 lbs.,	25.0	2.7	13.3	0.6	16.6	1 : 5.5
8–11	75 lbs.,	23.0	2.1	11.4	0.5	14.0	1 : 6.0
11–15	82 lbs.,	22.5	1.7	10.9	0.4	13.0	1 : 7.0
15–20	85 lbs.,	22.0	1.4	10.4	0.3	12.1	1 : 8.0
11. Growing fat pigs:							
2–3	50 lbs.,	42.0	7.5	30.0		37.5	1 : 4.0
3–5	100 lbs.,	34.0	5.0	25.0		30.0	1 : 5.0
5–6	125 lbs.,	31.5	4.3	23.7		28.0	1 : 5.5
6–8	170 lbs.,	27.0	3.4	20.4		23.8	1 : 6.0
8–12	250 lbs.,	21.0	2.5	16.2		18.7	1 : 6.5

PER DAY AND HEAD.

Growing cattle:							
Age. Months.	*Average live weight per head.*						
2–3	150 lbs.,	3.3	0.6	2.1	0.30	3.00	1 : 4.7
3–6	300 lbs.,	7.0	1.0	4.1	0.30	5.40	1 : 5.0
6–12	500 lbs.,	12.0	1.3	6.8	0.30	8.40	1 : 6.0
12–18	700 lbs.,	16.8	1.4	9.1	0.28	10.78	1 : 7.0
18–24	850 lbs.,	20.4	1.4	10.3	0.26	11.96	1 : 8.0
Growing sheep:							
5–6	56 lbs.,	1.6	0.18	0.87	0.045	1.095	1 : 5.5
6–8	67 lbs.,	1.7	0.17	0.85	0.040	1.060	1 : 5.5
8–11	75 lbs.,	1.7	0.16	0.85	0.037	1.047	1 : 6.0
11–15	82 lbs.,	1.8	0.14	0.89	0.032	1.062	1 : 7.0
15–20	85 lbs.,	1.9	0.12	0.88	0.025	1.0 6	1 : 8.0
Growing fat swine:							
2–3	50 lbs.,	2.1	0.38	1.50		1.88	1 : 4.0
3–5	100 lbs.,	3.4	0.50	2.50		3.00	1 : 5.0
5–6	125 lbs.,	3.9	0.54	2.96		3.50	1 : 5.5
6–8	170 lbs.,	4.6	0.58	3.47		4.05	1 : 6.0
8–12	250 lbs.,	5.2	0.62	4.05		4.67	1 : 6.5

*The fattening rations are calculated for 1,000 lb. live weight *at the beginning of the fattening.*

CEREAL CROPS OF THE UNITED STATES.

	Crops of 1874.			1875.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	309,102,700	12.3	24,967,027	292,136,000	11.0	26,381,512
Corn, ...	850,148,500	20.7	41,036,918	1,321,069,000	29.4	44,841,371
Oats, ...	240,369,000	22.0	10,897,412	354,317,500	29.7	11,915,075
Rye, ...	14,990,900	13.4	1,116,716	17,722,100	13.0	1,359,788
Barley, ...	32,552,500	20.6	1,580,626	36,908,000	20.6	1,789,902
Totals, . .	1,447,163,600		79,598,699	2,022,153,200		86,287,648

	1876.			1877.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	289,356,500	10.4	27,627,021	364,194,146	13.9	26,277,546
Corn, ...	1,283,827,500	26.1	49,033,364	1,342,558,000	26.6	50,369,113
Oats, ...	320,884,000	24.0	13,358,908	406,394,000	31.6	12,826,148
Rye, ...	20,374,800	13.8	1,468,374	21,170,100	14.9	1,412,902
Barley, ...	38,710,500	21.9	1,766,511	34,441,400	21.3	1,614,654
Totals, . .	1,953,153,300		93,254,178	2,168,757,646		92,500,363

	1878.			†1879.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	420,122,400	13.1	32,108,560	459,479,505	13.0	35,430,052
Corn, ...	1,388,218,750	26.9	51,585,000	1,754,861,535	28.1	62,368,869
Oats, ...	413,578,560	31.4	13,176,500	407,858,999	25.8	16,144,593
Rye, ...	25,842,790	15.9	1,622,700	19,831,595	10.8	1,842,303
Barley, ...	42,245,630	23.6	1,790,400	44,113,495	22.0	1,997,717
Totals, . .	2,290,008,130		100,283,160	2,686,145,129		117,783,534

	1880.			1881.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	498,549,868	13.1	37,986,717	383,280,090	10.2	37,709,020
Corn, ...	1,717,434,543	27.6	62,317,842	1,194,916,000	18.6	64,262,025
Oats, ...	417,885,380	25.8	16,187,977	416,481,000	24.7	16,831,600
Rye, ...	24,540,829	13.9	1,767,619	20,704,950	11.6	1,789,100
Barley, ...	45,165,346	24.5	1,843,329	41,161,330	20.9	1,967,510
Totals, . .	2,703,575,966		120,103,484	2,056,543,370		122,559,255

	1882.			1883.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	504,185,470	13.6	37,067,194	421,086,160	11.6	36,455,593
Corn, ...	1,617,025,100	24.6	65,659,546	1,551,066,895	22.7	68,301,889
Oats, ...	488,250,610	26.4	18,494,691	571,302,400	28.1	20,324,962
Rye.	29,960,037	13.4	2,227,889	28,058,583	12.1	2,314,754
Barley, ...	48,953,926	21.5	2,272,103	50,136,097	21.1	2,379,009
Totals. . .	2,688,375,143		125,721,423	2,621,650,135		129,776,207

† Census report.

CEREAL CROPS OF THE UNITED STATES—(*Continued.*)

	Crops of 1884.			1885.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	512,765,000	13.0	39,475,885	357,112,000	10.4	34,189,246
Corn, ...	1,795,528,000	25.8	69,683,780	1,936,176,000	26.5	73,130,150
Oats, ...	583,628,000	27.4	21,300,917	629,409,000	27.6	22,783,630
Rye, ...	28,640,000	12.2	2,343,963	21,756,000	10.2	2,129,301
Barley, ...	61,203 000	23.5	2,608,818	58,360,000	21.4	2,729,359
Totals, ...	2,981,764,000		135,413,363	3,002,813,000		134,961,686

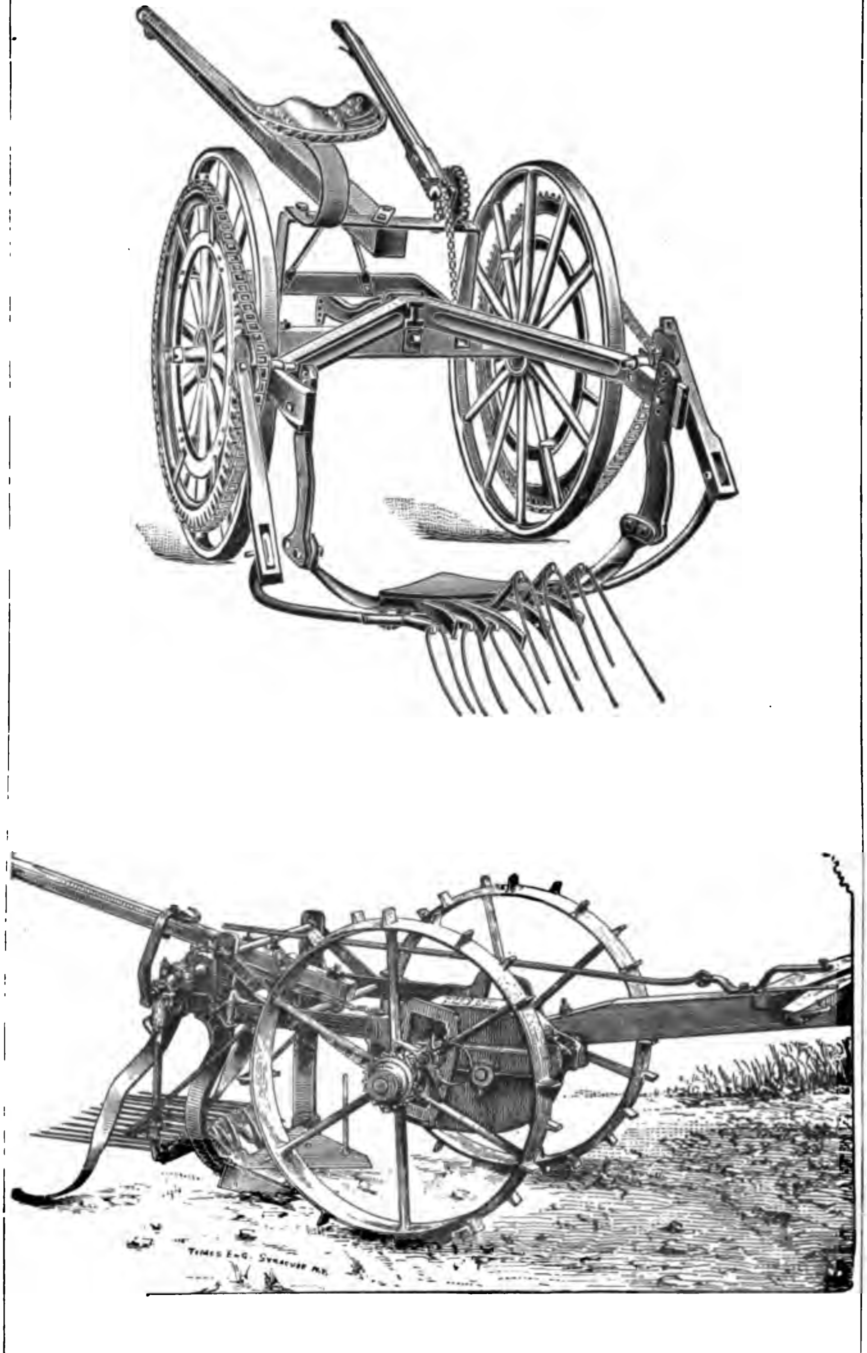
	1886.			1887.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	457,218,000	12.4	36,806,184	456,329,000	12.1	37,641,783
Corn, ...	1,665,441,000	22.0	75,694,208	1,456,161,000	20.1	72,392,720
Oats, ...	624,134,000	26.4	23,658,474	659,618,000	25.4	25,920,906
Rye, ...	24,489,000	11.5	2,129,918	20,693,000	10.1	2,053,447
Barley, ...	59,428,000	22.4	2,652,957	56,812,000	19.6	2,901,953
Totals, ...	2,830,710,000		140,941,741	2,649,613,000		140,910,809

	1888.			*1889.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	415,868,000	11.1	37,336,138	468,373,968	13.9	33,579,514
Corn, ...	1,987,790,000	26.2	75,672,763	2,122,327,547	29.4	72,087,752
Oats, ...	701,735,000	25.9	26,998,282	809,250,666	28.6	28,320,677
Rye, ...	28,415,000	12.0	2,364,805	28,421,398	13.1	2,171,604
Barley, ...	63,884,000	21.3	2,996,382	78,332,976	24.3	3,220,834
Totals, ...	3,197,692,000		145,368,870	3,506,706,555		139,380,381

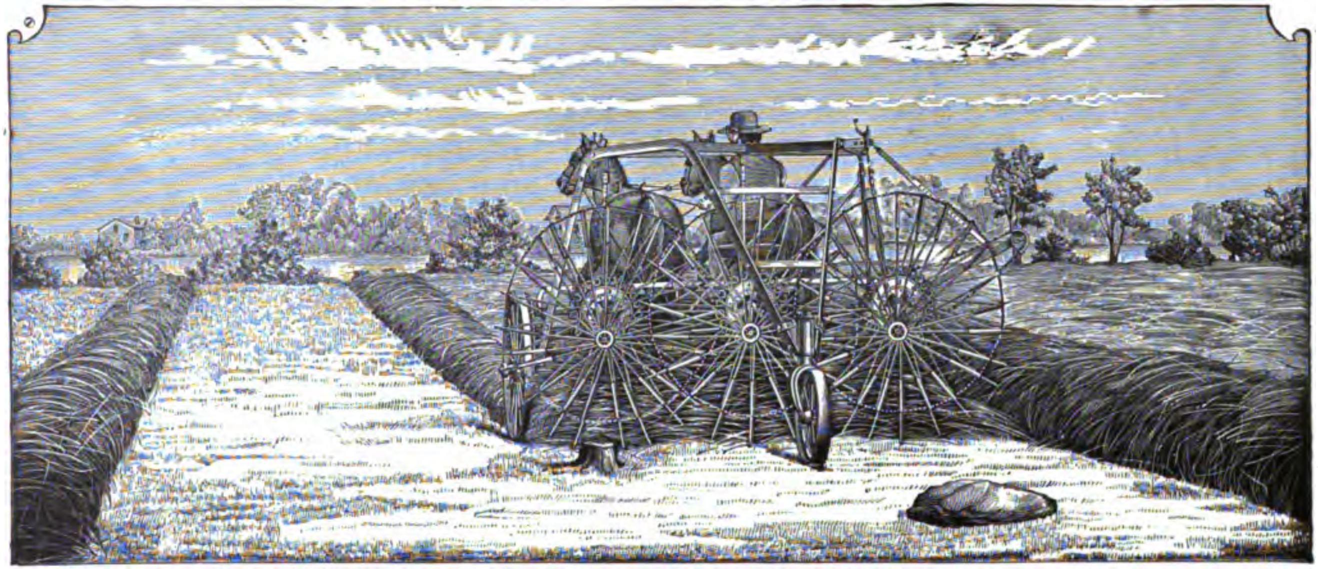
	1890.			1891.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	399,262,000	11.1	36,087,154	611,780,000	15.3	39,916,897
Corn, ...	1,489,970,000	20.7	71,970,763	2,060 154,000	27.0	76,204,515
Oats, ...	523,621,000	19.8	26,431,369	738,394,000	28.9	25,581,861
Rye, ...	†29,000,000	†11.8	†2,457,000	†36,000,000	†14.4	†2,500,000
Barley, ...	†58,800,000	†21.0	†2,800,000	†77,400,000	†25.8	†3,000,000
Totals, ...	2,500,653,000		139,746,286	3,523,728,000		147,203,273

	1892.			1893.		
	Bushels.	Average yield per acre.	Acres.	Bushels.	Average yield per acre.	Acres.
Wheat, ...	515,949,000	13.4	38,554,430	396,131,725	11.4	34,629,418
Corn, ...	1,628,464,000	23.1	70,626,658	1,619,496,131	22.5	72,036,465
Oats, ...	661,035,000	24.4	27,063,835	638,854,850	23.4	27,273,033
Rye, ...	†31,750,000	†12.7	†2,500,000	26,555,446	13.0	2,038,485
Barley, ...	†72,759,000	†23.7	†3,070,000	69,869,495	21.7	3,220,371
Totals, ...	2,909,957,000		141,814,923	2,750,907,647		139,197,772

*Census report. †Approximately.


TIMES ENG. SYRACUSE N.Y.

LOW DOWN POTATO DIGGERS.



SIDE DELIVERY RAKE AND TEDDER.

Exports of Cereals from the United States, with Values of Same, from 1876 to 1893.

Fiscal Years, July 1 to June 30.	Flour.			Wheat.			Wheat and Flour, Reduced.			Per Cent. of Flour.
	Barrels.	Aggregate value.	Average value per barrel.	Bushels.	Aggregate value.	Average value per bushel.	Bushels.	Aggregate value.	Average value per bushel.	In quantity.
1876-77,	3,343,665	$21,663,947	$6 47.8	40,325,611	$47,135,562	$1 16.9	57,043,936	$68,799,509	$1 20.6	29.30
1877-78,	3,947,333	25,095,721	6 35.7	72,404,961	96,872,016	1 33.8	92,141,626	121,967,737	1 32.3	21.42
1878-79,	5,629,714	29,567,713	5 25.2	122,353,936	130,701,079	1 06.8	147,687,649	160,268,792	1 08.5	17.15
1879-80,	6,011,419	35,333,197	5 87.7	153,252,795	190,546,305	1 24.3	180,304,176	225,879,502	1 25.3	15.03
1880-81,	7,945,786	45,047,257	5 66.2	150,565,477	167,698,485	1 11.3	186,321,514	212,745,742	1 14.1	19.18
1881-82,	5,915,686	36,375,055	6 14.8	95,271,802	112,929,718	1 18.5	121,892,389	149,304,773	1 22.4	21.82
1882-83,	9,205,664	54,824,459	5 95.6	106,385,828	119,879,341	1 12.6	147,811,316	174,703,800	1 18.2	28.02
1883-84,	9,152,260	51,139,696	5 58.7	70,349,012	75,026,678	1 06.6	111,534,182	126,166,374	1 13.1	36.92
1884-85,	10,648,145	52,146,336	4 89.8	84,653,714	72,933,097	86.2	132,570,366	125,088,689	94.4	34.15
1885-86,	8,179,241	38,442,955	4 70.0	57,759,209	50,262,715	87.0	94,565,793	88,705,670	90.6	38.92
1886-87,	11,518,449	51,950,083	4 51.0	101,971,949	90,716,481	89.0	153,804,970	142,666,563	92.8	33.70
1887-88,	11,963,574	54,777,710	4 57.9	65,789,261	56,241,468	85.3	119,625,344	111,019,178	92.8	45.00
1888-89,	9,374,803	45,296,485	4 83.2	46,414,129	41,652,701	89.7	88,600,743	86,949,186	98.1	47.61
1889-90,	12,231,711	57,036,168	4 66.8	54,387,767	45,275,906	83.2	109,430,467	102,312,074	93.5	50.30
1890-91,	11,344,304	54,705,616	4 82.2	55,131,948	51,420,272	93.3	106,181,316	106,125,888	99.9	48.08
1891-92,	15,196,769	75,362,283	4 95.9	157,280,351	161,399,132	1 02.6	225,665,812	236,761,415	1 04.9	30.30
1892-93,	16,620,339	75,494,347	4 54.2	117,121,109	93,534,970	79.9	191,912,635	169,028,317	88.1	38.97

Fiscal years, July 1 to June 30.	Corn-Meal.			Corn.			Corn and Meal, Reduced.			Per Cent. of Meal.
1876-77,	447,907	$1,511,152	$3 37.4	70,860,983	$41,621,275	$0 58.7	72,652,611	$43,133,397	$0 59.3	2.53
1877-78,	432,753	1,336,187	3 08.7	85,461,098	48,033,358	56.2	87,192,110	49,366,545	56.6	1.98
1878-79,	397,160	1,052,231	2 65.0	86,296,252	40,655,120	47.1	87,884,892	41,707,351	47.4	1.81
1879-80,	350,613	981,361	2 79.8	98,169,877	53,298,247	54.3	99,572,329	54,279,608	54.5	1.44
1880-81,	434,998	1,270,200	2 94.3	91,908,175	50,702,669	55.1	93,648,147	51,972,869	55.4	1.85
1881-82,	288,942	994,201	3 44.8	43,184,915	28,845,830	66.7	44,340,683	29,840,031	67.5	2.66
1882-83,	267,207	980,798	3 67.0	40,586,825	27,756,082	68.3	41,655,653	28,736,880	68.9	2.56
1883-84,	252,779	818,739	3 23.8	45,247,490	27,648,044	61.1	46,258,606	28,466,783	61.5	2.18
1884-85,	260,510	816,459	3 13.4	51,824,416	28,003,863	54.0	52,876,456	28,820,322	54.4	1.97
1885-86,	293,546	858,370	2 92.4	63,655,433	31,730,922	49.8	64,829,617	32,589,292	50.2	1.81
1886-87,	265,333	705,343	2 65.8	40,307,252	19,347,361	47.9	41,368,584	20,052,704	48.5	2.57
1887-88,	260,613	765,036	2 82.7	24,278,417	13,355,950	55.0	25,320,869	14,120,986	55.8	4.12
1888-89,	312,186	870,485	2 78.8	69,592,929	32,982,277	47.4	70,841,673	33,852,762	47.8	1.76
1889-90,	361,248	896,879	2 48.3	101,973,717	42,658,015	41.8	103,418,709	43,554,894	42.1	1.40
1890-91,	318,329	946,977	2 97.5	30,768,213	17,652,687	57.4	32,041,694	18,599,664	57.8	4.45
1891-92,	287,607	919,961	3 19.9	75,451,849	41,590,460	55.1	76,602,277	42,510,421	55.5	1.50
1892-93,	271,155	793,081	2 92.5	46,034,904	24,587,511	53.4	47,119,524	25,380,592	53.7	2.30

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Exports of Cereals from the United States, with Values of Same, from 1878 to 1893—*Continued.*

Fiscal Years, July 1 to June 30.	Rye Flour.			Rye.			Rye and Flour, Reduced.			Per Cent. of Flour.
	Barrels.	Aggregate value.	Average value per barrel.	Bushels.	Aggregate value.	Average value per bushel.	Bushels.	Aggregate value.	Average value per bushel.	In quantity.
1878-79, ...	4,351	$15,118	$3 47.3	4,851,715	$3,103,970	$0 63.9	4,871,294	$3,119,092	$0 64	.39
1879-80, ...	5,190	24,728	4 76.4	2,912,754	2,362,765	81.2	2,936,109	2,387,493	81.3	.79
1880-81, ...	4,453	24,062	5 40	1,928,437	1,845,818	97.2	1,948,475	1,909,895	97.7	1.54
1881-82, ...	4,948	28,593	5 77	973,921	946,086	97.1	996,187	974,679	97.8	2.23
1882-83, ...	6,031	25,070	4 16	2,170,026	1,657,998	75.7	2,197,165	1,683,068	76.6	1.23
1883-84, ...	4,564	18,876	4 13	6,220,206	4,323,105	69 5	6,240,544	4,341,981	69 6	.33
1884-85, ...	3,972	15,937	4 01	2,950,568	2,000,294	67.8	2,968,442	2,016,231	67.9	.60
1885-86, ...	3,329	12,738	3 82.5	196,725	133,105	67.7	211,705	145,843	68.9	7.08
1886-87, ...	3,341	11,781	3 52.6	357,256	216,190	60.5	372,290	227,971	61.2	4.04
1887-88, ...	2,674	10,068	3 76.5	78,783	50,703	64.4	90,816	60,778	66.9	13.25
1888-89, ...	3,669	13,370	3 64.4	287,253	158 917	55.3	303,763	172,287	56.7	5.43
1889-90, ...	3,933	13,782	3 50.4	2,257,377	1,279,814	56.7	2,275,076	1,293,596	56.9	.78
1890-91, ...	4,254	18 186	4 27.5	332,789	212,161	63.8	351,932	230,346	65.5	5.44
1891-92, ...	4,543	22,461	4 94.4	12,040,716	11,432,160	94.9	12,068,888	11,454,621	95.1	.15
1892-93, ...	2,811	10,290	3 66.1	1,477,058	1,002,796	68.0	1,491,113	1,013,016	67.9	.09

Fiscal Years, July 1 to June 30.	Oats.			Barley.			Total Cereals.			Average of the monthly means of value of gold.
1878-79, ...	5,452,136	$1,618,644	$0 29.6	715,536	$401,180	$0 56	246,611,507	$207,115,059	$0 84	$1 00
1879-80, ...	766,366	308,129	40 2	1,128,923	784,819	69.5	284,707,908	283,639,361	99.6	1 00
1880-81, ...	402,904	186,839	46.3	855,246	549,215	64.2	283,176,286	267,364,650	94.3	1 00
1881-82, ...	625,690	298,349	47.6	205,930	151,575	73.6	168,060,879	180,569,407	1 07.4	1 00
1882-83, ...	461,496	233,843	50.6	433,005	299,197	69.1	192,558,636	205,656,728	1 06.8	1 00
1883-84, ...	1,760,376	700,691	30.9	724,955	404,622	55 8	166,518,663	160,079,454	96 1	1 00
1884-85.	4,191,692	1,589,640	37.9	629,130	346,302	55	193,235,293	157,861,257	81.6	1 00
1885-86, ...	5,672,694	1,944,772	34.3	252,183	166,380	66	165,581,992	123,551,902	74.7	1 00
1886-87, ...	440,283	179,634	40.8	1,305,300	853 405	65.4	197,291,427	163,980, 77	83.1	1 00
1887-88, ...	333,564	143,284	43 4	550,884	317,239	57.6	145,920,477	125,661,460	86.1	1 00
1888-89, ...	624,226	245,562	39.3	1,440,320	853,490	59.3	161,810,726	122,073,257	75.4	1 00
1889-90, ...	13,692,776	4,510,056	32.9	1,408 311	754,605	53.6	230,235,339	152,425,224	66.2	1 00
1890-91, ...	953,010	405,708	42.6	973,062	669,203	68 8	140 659,964	126,080,809	89.6	1 00
1891-92, ...	9,435,078	3,842,559	40.7	2,800,075	1,751,445	62.5	328,562,130	298,320,461	90.7	1 00
1893-94, ...	2,380,653	961,920	40.0	3,035,267	1,468,843	48.4	245,989,192	197,843,688	80.4	1 00

OFFICE OF

Pennsylvania State Board of Agriculture.

Harrisburg, Pa., January 1st, 1895.

Owing to marked changes in the market prices of fertilizer ingredients, a change in our schedule became necessary. Accordingly, a circular was prepared announcing a schedule of valuations closely corresponding with that issued by New England, New Jersey and New York, except a separate valuation for rock phosphoric acid was made, and otherwise computed in accordance with the method heretofore used by us.

Further consideration has led to the belief that it would be better to arrange a method including all the elements entering into the cost of fertilizers, under the usual conditions of sale.

In accordance with this belief, Dr. Frear, the Chemist of the Board, has submitted the following schedule of valuations, based upon the average wholesale prices of fertilizer ingredients in New York, from September 1st, 1893, to May 1st, 1894; in recommending the schedule to the committee, Dr. Frear thus alludes to the items which enter into the valuation of a fertilizer, and enumerates them as follows:

1. "The wholesale cost of the ingredients.
2. The jobbers' gross profits on the sale of the ingredients; this includes office expenses, advertising, losses, etc.; for the purpose of the present computation, it may be assumed that the sum of this gross profit and the wholesale cost of the ingredients is equivalent to the retail price of the single ingredients, near the wholesale market, in one ton lots of original packages, for cash.
3. The expense and profit of mixing. This item applies only to Complete fertilizers, Rock and potash, and Ammoniated rock, and not to Dissolved or Ground bone or Dissolved rock.
4. The expense and profit of bagging.
5. The agents' commissions; this item includes not only the commission proper, but every advance in price due to the sale of the goods through an agent in small quantities, on time, rather than directly to the consumer in ten lots for cash.
6. Freight from the wholesale market to the point of delivery."

The schedule of valuations as recommended by Dr. Frear, and as adopted by the Advisory Committee of the Board, is as follows:

	Cts. per lb.
Nitrogen in ammonia salts,	19
In nitrates,	14½
in dry and fine ground fish, meat and blood, and in *mixed fertilizers*,	18½
in cotton seed meal and castor pomace,	15
in fine bone and tankage,	12½
in fine-medium bone and tankage,	11
in medium bone and tankage,	9
in coarse bone and tankage,	5½
in hair, horn shavings and coarse fish scrap,	7

Phosphoric acid, soluble in water, in bone fertilizers,	6
soluble in water, in rock fertilizers,	4
soluble in ammonium citrate,* in bone fertilizers,	5½
soluble in ammonium citrate, in rock fertilizers,	3½
insoluble in ammonium citrate,	2
in fine bone and tankage,	4
in fine-medium bone and tankage,	3½
in medium bone and tankage,	2½
in coarse bone and tankage,	2
Phosphoric acid, in fine ground fish, cotton seed meal, castor pomace and wood ashes,	5
Potash in high grade sulphate and in forms free from muriate (or chloride),	5½
as muriate,	4½

Potash in excess of that equivalent to the chlorine present, will be valued as sulphate, and the remainder as muriate.

Nitrogen in mixed fertilizers will be valued as derived from the best sources of organic nitrogen, unless clear evidence to the contrary is obtained.

Phosphoric acid in mixed fertilizers is valued at bone phosphate prices, unless clearly found to be derived from rock phosphate.

Grouud bone is sifted into four grades of the following fineness: Fine, less than one-fiftieth inch; fine medium, less than one-twenty-fifth inch; medium, less than one-twelfth inch, and coarse, over one-twelfth inch.

The result obtained by the use of these valuations does not cover the items of mixing, bagging, freight and agents' commissions. To cover these, allowances are made as follows:

For freight, an allowance of $2.00 per ton on all fertilizers.

For bagging, an allowance of $1.00 per ton on all fertilizers.

For mixing, an allowance of $1.00 per ton for complete fertilizers, and rock and potash goods.

For agents' commissions, an allowance of 20 per cent. is added to the cash value of the goods ready for shipment.

To illustrate the application of this valuation to South Carolina Rock, Dr Frear furnishes the following calculation:

Phosphoric acid:

Soluble,	11.50	230 lbs. @ 4 cts. —	$9.20
Reverted,	2.50	50 lbs. @ 3½ cts.	$1.75
Insoluble,	1.00	20 lbs. @ 2 cts.	$0.40
Retail cash value of ingredients,			$11.35
Bagging,			$ 1.00
Cash value of goods ready for shipment,			$12.35
Agents' commission, 20 per cent.,			$ 2.47
Freight,			$ 2.00
Commercial value per ton,			$16.82

In order to illustrate the differences between the valuations obtained by this schedule, that which was in force from 1888 to 1894, that used by the New England States and that of Maryland, Dr. Frear furnishes us with the following table:

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*Neutral solution of 1.09 sp. gr., using 100 c. c. for 30 minutes at 65°C.

	Complete fertilizer.	Rock and potash.	Dissolved animal bone.	Dissolved S. C. Rock.	Ground bone.
Number of samples included, .	334	27	17	64	75
Average selling price, ...	$29.54	$21,22	$27.22	$16.98	$29.54
Valuation by the new schedule,	$29.58	$18.26	$28.32	$17.32	$29.72
*By the former schedule, . .	$28.84	$18,95	$30.06	$23.13	$36.09
†By the New England schedule,	$20.98	$16.03	$20.93	$17.45	$28.92
*By the Maryland schedule, .	$23.41	$17.20	$22.42	$17.88	$26.00

*Includes no allowance for freight or commissions.
†Includes no allowance for mixing, bagging, freight or commission.

The valuation obtained by the use of these figures *is not intended to show the relative agricultural value of the fertilizer;* this depends upon the soil and crop to which the fertilizer is applied, as well as upon the kind and proportion of the ingredients used; the "Comparative Commercial Value per ton," is intended to show *what it would cost to buy the ingredients in one ton lots and mix them at* home, and it should, in no case, be confounded with the agricultural value of the fertilizer.

The reader is cautioned against comparing the valuations given in the following tables with those of former lists; the rates of valuation having been altered, as above stated, the Comparative Commercial Values of this list cannot be compared with those of former ones. This is important, and if strictly adhered to, will save vexatious errors and mistakes.

Respectfully yours,
THOS. J. EDGE, Sec'y.

TABULATED ANALYSES OF COMMERCIAL FERTILIZERS.

From samples selected by the Secretary and Special Agents of the Pennsylvania State Board of Agriculture. Analyses by DR. WILLIAM FREAR, *Chemist of the Board, and of the State College Experiment Station, State College, Pa.*

Samples Selected from August 1, 1894, to January 1, 1895.

COMPLETE FERTILIZERS.

Containing Phosphoric Acid, Potash and Nitrogen.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
107	Allegheny City Fert. Works, Allegheny, Pa.,	Pure Raw Bone Phosphate,	Wilmore,	6.87	8.04	3.78	1.65	1.28	4.03	$41 17	$35 00	107
545	J. J. Allen's Sons, Philadelphia, Pa.,	Texana Guano,	Morrisville,	12.69	0.57	1.96	1.15	0.54	0.77	12 26	10 00	545
103	Baltimore Guano Co., Baltimore, Md.,	Eagle Phosphate,	Johnstown,	7.82	3.80	6.56	2.26	1.09	0.57	23 24	25 00	103
229	" " "	Baltimore Special,	Lewisburg,	7.15	3.50	3.86	2.79	3.00	0.89	23 10	25 00	229
230	" " "	Game Guano,	Lewisburg,	10.94	8.22	1.31	1.96	1.70	1.94	29 38	28 00	230
284	" " "	Alkaline Bone,	Kittanning,	11.92	2.76	7.50	1.92	1.77	....	16 17	19 50	284
56	Baugh & Sons Co., Philadelphia, Pa.,	Double Eagle Phosphate,	Hanover,	2.42	6.53	2.54	4.25	....	2.34	29 46	24 00	56
57	" " "	Export Bone with Potash,	Hanover,	5.12	1.52	2.57	6.91	3.56	1.98	25 99	27 00	57
96	" " "	$25 Phosphate,	Johnstown,	8.51	7.23	2.43	2.98	....	2.30	29 51	25 00	96

332	" " "	Animal Bone and Potash,......	Watsontown, ...	13.00	6.55	1.95	3.06	2.32	1.69	27 91	26 00	332
333	" " "	Raw Bone Super Phosphate,.	Watsontown, ...	9.07	7.63	3.43	1.93	0.37	2.00	30.15	32.00	333
542	The Berg Co., Philadelphia, Pa., ...	Am'td. Dis. Bone & Potash,.	Buckingham, ...	9.86	5.71	2.85	4.69	4.25	2.23	33 21	30 00	542
472	E. K. Bollinger & Co., Seitzland, Pa.,......	Rising Star Phosphate, ...	Oxford, ...	10.70	7.36	3.17	1.56	1.13	0.68	24 27	23 00	472
473	" " "	Ammoniated Phosphate, ...	Oxford, ...	11.07	6.33	2.89	2.61	0.86	0.78	23 07	24 00	473
183	Bowker Fertilizer Co., Boston & New York,	Potato and Vegetable Manure.	Homer City, ...	6.60	2.99	4.38	6.43	4.06	2.72	33 97	35 00	183
197	" " "	Sure Crop Fertilizer, ...	Blairsville, ...	11.87	6.38	3.54	3.17	1.14	0.96	25 29	28 00	197
367	" " "	Sure Crop Fertilizer, ...	Butler, ...	11.00	4.25	5.78	3.11	1.02	0.87	24 52	28 00	367
448	" " "	Hill and Drill Phosphate,.....	Quakertown, ...	11.43	7.44	2.24	3.11	2.37	1.74	29 91	35 00	448
112	Bradley Fertilizer Co., Boston, Mass.,......	Dissolved Bone with Potash,	Wilmore, ...	9.81	2.06	7.17	2.57	2.39	1.13	25 75	30 00	112
125	" " "	Fine Gr'nd Bone with Potash,	Carrolltown, ...	5.06	1.02	3.82	13.03	2.41	1.95	28 38	30 00	125
126	" " "	"B. D." Sea Fowl Guano,....	Carrolltown, ...	9.73	6.50	3.27	2.82	1.84	1.94	30 09	33 00	126
259	" " "	Potato Phosphate, ...	Pittsburgh, ...	10.27	6.37	4.70	1.63	2.78	2.12	32 89	30 00	259
519	" " "	Niagara Phosphate, ...	Somerset, ...	12.81	4.63	3.96	2.03	1.27	0.96	22 93	26 00	519
531	" " "	Ammoniated Dissolved Bone,	Somerset, ...	7.31	4.74	5.18	3.12	0.84	1.95	29 18	30 00	531
35	A. R. Brodbeck, Hanover, Pa., ...	York Am'td. Raw Bone Phos.	Hanover, ...	2.65	6.15	2.60	4.71	3.33	1.45	29 01	26 00	35
36	" " "	Maud S. Quick Acting Phos.,	Hanover, ...	3.25	5.05	4.47	2.85	2.42	1.11	26 40	23 00	36
310	Brown & Gilman, Philadelphia, Pa., ...	No. 5 Bone Phosphate, ...	Selinsgrove, ...	14.20	4.87	2.59	2.22	2.31	0.71	21 49	25 00	310
92	Cambria Fertilizer Co., Johnstown, Pa.,....	Lion Am'td. Bone Phosphate,	Johnstown, ...	4.53	5.32	3.06	2.28	....	3.58	32 93	30 00	92
93	" " "	Standard Phosphate, ...	Johnstown, ...	11.74	3.71	2.62	0.68	3.82	2.57	28 93	28 00	93
109	Chesapeake Guano Co., Baltimore, Md.,....	Corn and Oats Fertilizer,.....	Wilmore, ...	8.97	6.29	1.94	2.43	2.23	1.96	28 30	24 00	109
118	" " "	Chesapeake Guano, ...	Wilmore, ...	5.47	3.12	6.06	2.50	1.74	2.40	30 68	30 00	118
489	" " "	Ammoniated Alkaline Guano,	Fairville, ...	10.40	6.46	1.95	2.33	1.92	1.87	27 67	23 00	489
143	Chemical Co. of Canton, Baltimore, Md.,	Baker's Special Mixture,......	Tyrone, ...	11.15	7.21	2.27	2.08	1.61	1.11	25 36	25 00	143
250	" " "	Soluble Bone and Potash, ...	Apollo, ...	11.92	3.25	7.99	0.92	1.94	....	16 78	20 00	250

COMPLETE FERTILIZERS—Continued.

Sample number.	Name and Address of Manufacturers.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
257	Chemical Co. of Canton, Baltimore, Md.,	Potato Manure, ...	Kittanning, ...	5.07	7.13	2.97	2.48	3.68	0.86	27 57	28 00	267
315	" " "	Tankage, ...	Pottsgrove, ...	9.21	0.58	9.65	7.66	....	4.80	41 79	30 00	315
512	" " "	Baker's Standard Guano, ...	Rockwood, ...	11.15	7.55	1.73	2.20	2.45	2.05	30 40	30 00	512
513	" " "	Baker's Wheat & Corn Mixt..	Rockwood, ...	10.20	4.34	4.35	2.93	2.23	1.00	24 68	25 00	513
544	" " "	Soluble Alkaline Bone, ...	Pineville, ...	11.40	6.11	5.40	2.28	2.20	....	18 27	24 00	544
396	R. L. Christie & Co., Baltimore, Md.,.......	Wheat and Grass Special,....	Peach Bottom, ...	11.87	7.48	2.27	1.82	1.91	1.67	28 42	21 00	396
171	Cincinnati Dessicating Co., Cincinnati, O.,	Dissolved Animal Bone, ...	Indiana, ...	3.25	3.41	9.43	9.42	....	2.39	35 74	32 00	171
172	" " "	Pure Gilead Super Phosphate,	Indiana, ...	6.10	3.93	3.86	4.45	2.18	2.89	32 56	30 00	172
174	" " "	Phoenix Phosphate, ...	Indiana, ...	4.67	0.87	5.78	4.97	0.98	2.11	26 06	22 00	174
176	" " "	Ohio Valley Phosphate, ...	Indiana, ...	5.85	1 21	6.36	4.34	1.96	2.16	28 27	26 00	176
438	Clark's Cove Fertilizer Co., New York,.....	King Philip Alkaline Guano,	Gardenville, ...	9.92	1.79	4.42	4.85	3.46	1.74	26 64	30 00	438
350	E. A. Clendennin & Bro., Colora, Md.,	Dissolved Bone, ...	Sarversville, ...	7.31	6.83	3.38	4.83	....	2.02	28 74	28 00	350
407	" " "	National Stand. Am'd Phos.,	Fairmount, ...	8.39	8.29	3.47	2.67	1.74	1.38	30 32	24 00	407
189	Cleveland Dryer Co., Cleveland, O.,.........	Ohio Seedmaker with Potash,	Saltsburg, ...	6.98	7.40	3.52	4.12	1.03	1.36	28 81	26 00	189
255	" " "	Ammoniated Dissolved Bone,	Pittsburgh, ...	4.55	6.52	5.18	3.71	....	1.05	25 87	25 00	255
357	" " "	Buckeye Am'd Bone Phos.,...	Freeport, ...	5.72	7.15	3.75	3.21	....	1.77	27 76	29 00	357
358	" " "	Forest City Bone with Potash	Leechburg, ...	6.67	6.20	3.25	3.58	1.75	2.01	30 13	32 00	358

277	E. Frank Coe Co., New York, ...	Ralston's Knickerbocker Phos.	Kittanning, ...	9.22	7.24	2.29	2.97	1.48	1.50	27 93	28 00	277
279	" "	Matchless Grain Fertilizer,...	Kittanning, ...	7.36	6.73	3.94	4.51	1.24	0.79	26 71	26 00	279
280	" "	XXV Am'd Bone Super Phos.	Kittanning, ...	5.12	6.00	4.53	3.67	1.28	1.36	28 52	26 00	280
459	Henry Cope & Co., Lincoln University, Pa.,	Ammoniated Bone Phosphate,	Oxford, ...	8.05	2.30	4.87	5.50	1.69	1.24	24 15	25 00	459
460	" " "	Pure Bone Phosphate, ...	Oxford, ...	5.95	3.11	4.65	4.93	1.95	2.41	30 15	29 00	460
461	" " "	Sol. Bone Phos., and Potash.	Oxford, ...	12.52	4.34	4.57	1.58	3.69	....	17 17	18 00	461
462	" " "	Dead Shot Super Phosphate.	Oxford, ...	7.22	2.09	5.06	4.72	1.73	1.11	23 13	24 00	462
500	J. A. Cranston Co., Newport, Del., ...	Pennsylvania Super Phos......	Dewart, ...	12.42	5.67	3.10	2.61	1.91	0.95	24 15	23 00	500
261	Crocker Chem. & Fert. Co., Buffalo, N. Y.,	Am'd Wheat & Corn Phos.,...	Pittsburgh, ...	8.67	7.98	2.87	1.46	1.86	1.89	30 82	32 00	261
262	" " "	Am'd Bone Super Phosphate,	Pittsburgh, ...	6.77	8.22	2.56	0.98	1.39	3.11	35 34	34 00	262
264	" " "	New Rival Am'd Super Phos.,	Pittsburgh, ...	8.77	6.81	3.04	2.00	2.06	1.35	27 40	27 00	264
363	" " "	Practical Am'd Super Phos.,	Butler, ...	8.35	6.10	2.49	2.63	1.21	0.91	23 02	28 00	363
198	Cumberland Co. Fert. Co., Carlisle, Pa.,	Alliance Fav.No.1, for Wheat,	Black Lick, ...	6.57	2.55	4.48	3.42	2.18	0.89	22 02	23 00	198
201	" " "	Leading Potato Grower, ...	Black Lick, ...	9.25	4.28	3.26	1.79	5.90	1.13	27 24	29 00	201
40	Detrick Fertilizer Co., Baltimore, Md., ..	Soluble Bone and Potash Fert.	Dutra Station, ...	2.99	9.09	5.36	1.56	1.89	....	20 43	16 00	40
41	" " " ..	Ammoniated Super Phos.....	Dutra Station, ...	4.59	7.85	2.76	4.38	1.96	1.90	32 00	26 00	41
414	James G. Downward & Son, Coatesville, Pa.	Ammoniated Phosphate, ...	Norwood, ...	10.58	6.11	2.47	1.90	2.20	1.29	25 51	24 00	414
450	" " "	Special Wheat and Grass Fer.,	Kelton, ...	10.85	6.68	2.56	2.32	2.89	2.17	31 21	30 00	450
127	Eureka Fertilizer Co., Perryville, Md.,....	Farmers' Bone Phosphate,....	Bradley Junction, .	10.30	5.38	2.49	5.80	1.46	1.58	26 86	27 40	127
128	" " "	Alkaline Bone and Potash,....	Bradley Junction, .	11.25	8.04	2.94	3.57	0.56	....	16 92	18 00	128
145	" " "	Imperial Bone Phosphate,.....	Hillsdale, ...	11.62	6.47	2.76	4.65	0.62	0.70	23 31	27 00	145
3	T. E. Evans, Stokesdale Junction, Pa.,.....	Wood Ashes, ...	Stokesdale Junc.,..	0.55	....	....	1.72	1.15	....	$2 97	$2 50	3
379	Washington Ewing, Landenberg, Pa.,.......	Eclipse Raw Bone Phosphate,	Nottingham, ...	9.62	3.63	4.21	3.84	2.17	0.76	22 71	25 00	379
49	W. S. Farmer & Co., Baltimore, Md.,....	Harvest Queen Phosphate,....	Littlestown, ...	5.92	7.83	2.95	2.18	2.31	1.11	28 00	25 00	49
393	" " "	Clyde Brand, ...	Peach Bottom, ...	13.07	6.54	2.69	1.78	2.58	0.81	24 60	20 00	393

COMPLETE FERTILIZERS—Continued.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
395	W. S. Farmer & Co., Baltimore, Md., ...	B. & P. Fertilizer, ...	Peach Bottom, ...	14.35	8.71	3.26	1.35	1.96	....	18 83	17 00	395
132	Farmers' Fertilizer Co., Syracuse, N. Y., ..	Standard Ammoniated Bone, .	Loretto, ...	9.80	5.64	2.67	0.71	3.34	0.75	23 34	32 00	132
533	Mahlon Fretz, Sellersville, Pa., ...	$25 Phosphate, ...	Sellersville, ...	9.93	2.50	9.07	3.24	0.82	....	16 83	23 00	533
534	" " "	Fish and Blood Guano, ...	Sellersville, ...	13.12	4.31	5.86	1.70	1.73	1.58	28 14	28 00	534
535	" " "	Standard Ammoniated Phos.,	Sellersville, ...	9.40	1.96	10.38	1.89	0.86	1.00	27 21	26 00	535
483	Joseph R. Gawthrop, Kennett Square, Pa.,	Champion Bone Fertilizer, ...	Kennett Square, ..	3.04	1.73	3.02	8.20	0.69	1.33	21 74	25 00	483
485	" " "	Dissolved Bone Phosphate, ...	Kennett Square, ..	6.22	4.74	3.20	2.04	3.56	1.00	25 58	24 00	485
233	Great Eastern Fertilizer Co., Rutland, Vt.,	General Wheat Special, ...	Lewisburg, ...	11.18	5.97	2.41	1.77	3.19	1.56	26 26	28 00	233
325	" " "	English Wheat Grower, ...	Millmont, ...	13.28	1.19	9.29	2.89	1.29	0.82	24 73	27 00	325
239	Griffith & Boyd, Baltimore, Md., ...	Ammoniated Bone Phosphate,	Mifflinburg, ...	14 04	6.83	2.26	2.12	1.82	1.69	27 74	25 00	239
309	" " "	Cereal Plant Food, ...	Freeburg, ...	11.72	4.44	4.10	1.34	2.03	1.08	23 97	20 00	309
479	" " "	Valley Fertilizer, ...	Avondale, ...	14.16	5.92	2.34	1.48	1.65	0.61	20 73	22 00	479
538	H. F. Hager, Quakertown, Pa., ...	Ammoniated Super Phos., ...	Quakertown, ...	5.55	4.66	6.11	3.85	3.24	2.96	37 62	33 00	538
539	" " "	Farmers' Favorite Phosphate,	Quakertown, ...	9.82	4.23	4.84	1.71	2.37	1.76	28 05	24 00	539
184	S. M. Hess & Bro., Philadelphia, Pa., ...	Emperor Phosphate, ...	Homer City, ...	9.39	5.31	6.37	2.47	1.08	....	17 22	21 00	184
222	" " "	Am'd Bone Super Phosphate,	Jamison, ...	15.56	1.00	8.34	1.80	1.87	1.78	27 19	32 00	222
242	" " "	Keystone Bone Phosphate, ..	New Columbia, ...	11.43	7.14	3.55	2.04	1.33	0.61	24 50	25 00	242

307	Hubbard & Co., Baltimore, Md., ...	Columbia Gem Phosphate, ...	Middleburg, ...	10.77	6.06	5.63	1.06	1.42	0.52	24 81	20 00	307
402	" " "	Oriental, for Wh't & Grass, ..	Fairmount, ...	11.90	6.18	2.53	1.35	1.62	0.94	23 30	21 00	402
403	" " "	Wheat Growers' Jewel, ...	Fairmount, ...	9.86	7.48	2.84	1.64	1.52	1.17	26 47	23 00	403
411	" " "	Standard Bone Super Phos., ..	Fairmount, ...	9.66	5.93	4.30	2.32	1.99	1.84	30 13	26 00	411
101	Jarecki Chemical Co., Sandusky, O., ...	Lake Erie Fish Guano, ...	Johnstown, ...	3.30	2.57	6.57	4.64	....	1.05	22 50	28 00	101
524	" " "	Bone and Phos. Mixture, ...	Jenner's X Roads, ..	3.68	5.72	2.17	9.74	0.27	1.72	28 04	30 00	524
214	T. S. Kenderdine, Newtown, Pa., ...	Potato Phosphate, ...	Pineville, ...	7.52	5.39	3.71	2.36	8.51	2.62	38 91	33 00	214
82	Kenderdine & Rice, Lumberville, Pa., ...	A. A. Phosphate, ...	Lumberville, ...	10.47	6.71	2.72	1.87	5.52	1.42	30 73	28 00	82
53	G. F. Krug, Kingsdale, Pa., ...	Ammoniated Bone Phosphate,	Kingsdale, ...	5 67	7.00	2.83	1.71	2.13	1.87	29 61	24 00	53
67	Lancaster Chemical Co., Lancaster, Pa.,	Flag Brand Super Phosphate,	Hanover, ...	2.43	3.81	3.90	1.96	2.97	1.11	24 74	24 00	67
436	Samuel Larzelere, Philadelphia, Pa., ...	Bone Phosphate, ...	Doylestown, ...	12.30	7.28	2.53	2.12	2.44	1.79	29 94	28 00	436
39	Lister's Agr'l Chem. Works, Newark, N. J.,	Standard Pure Bone Phos., ..	New Oxford, ...	4.41	8.32	1.91	3.38	1.88	2.45	33 43	30 00	39
168	" " "	U. S. Super Phosphate, ...	Indiana, ...	10.75	3.90	2.80	2.57	2.26	1.57	24 26	26 00	168
169	" " "	Harvest Queen Phosphate, ...	Indiana, ...	12.55	7.71	1.66	2.57	2.09	1.70	28 74	27 00	169
170	" " "	Celebrated Ground Bone, ...	Indiana, ...	3.52	1.97	3.89	8.65	....	2.73	28 72	29 00	170
207	" " "	Ammoniated Bone Phosphate,	Lahaska, ...	9.65	8.68	2.24	1.71	2.02	1.97	31 54	30 00	207
208	" " "	Success Fertilizer, ...	Lahaska, ...	9.24	8.18	2.32	2.51	1.85	1.55	29 46	28 00	208
134	Mapes Formula & Peruvian Guano Co., N. Y.	Complete Manure, A Brand, ..	Loretto, ...	9.96	5.82	3.18	3.82	3.17	2.58	33 75	35 00	134
227	" " "	Com. Manure for Light Soils,	Lewisburg, ...	12.64	5.74	1.51	1.70	6.84	4.75	43 96	45 00	227
439	" " "	XXV Phosphate, ...	Plumsteadville, ..	14.15	6.55	2.26	0.88	1.01	1.92	26 76	25 00	439
440	" " "	Am'd Dis. Bone with Potash,	Plumsteadville, ...	8.71	8.72	3.43	1.78	2.18	1.64	32 06	30 00	440
21	Maryland Fertilizing Co., Baltimore, Md.,	Alkaline Bone, ...	Littlestown, ...	9.05	7.83	3.52	1.94	3.70	....	19 81	24 00	21
206	" " "	Ammoniated Bone, ...	Lahaska, ...	10.63	6.43	4.49	1.17	2.01	1.91	30 78	31 00	206
301	" " "	Ammoniated Bone, ...	Middleburg, ...	10.65	4.95	3.47	4.49	1.88	1.84	28 53	28 00	301
302	" " "	Linden Super Phosphate.	Middleburg, ...	12.70	7.56	3.82	1.90	2.11	....	18 07	20 00	302

COMPLETE FERTILIZERS—Continued.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
303	" " "	Globe Fertilizer, ...	Middleburg, ...	9.87	5.18	2.97	3.79	1.60	1.56	26 23	26 00	303
507	McCalmont & Co., Bellefonte, Pa.,..........	Champion $25 Am'd Bone,....	Bellefonte, ...	12.75	3.69	7.56	1.37	1.21	1.89	30 08	25 00	507
508	" " "	Champion $25 Am'd Bone,....	Bellefonte, ...	8.07	7.19	2.29	2.45	2.32	1.95	30 13	25 00	508
10	F. Mehring, Bruceville, Md., ...	Am'd No. 2 Phosphate, ...	Biglerville, ...	7.16	7.51	3.70	3.75	1.72	1.25	29 28	25 00	10
11	" " "	Dissolved Raw Bone, ...	Biglersville, ...	4.34	8.24	7.86	3.74	....	1.36	33.25	30 00	11
26	" " "	Twenty-Six Dollar Phosphate,	Littlestown, ...	5.28	8.00	3.53	3.71	1.10	1.26	29.13	20 00	26
162	Milsom Rendering & Fert. Co., Buffalo, N. Y.	Buffalo Fertilizer, ...	Indiana, ...	6.56	6 04	3.51	2.42	1.64	1.83	28 89	28 50	162
163	" " "	Dissolved Bone and Potash,..	Indiana, ...	8.78	5.81	3.35	3.10	1.45	....	15 85	22 00	163
164	" " "	Wheat, Oats and Barley Phos.	Indiana, ...	11.58	6.81	1.59	2.10	2.48	1.29	25 90	25 00	164
211	Mitchell Fertilizer Co., Tremley, N. J.,....	Standard Super Phosphate, ..	Forest Grove, ...	6.75	8.82	1.87	3.26	2.37	1.37	30 21	32 00	211
212	" " "	Alkaline Bone, ...	Forest Grove, ...	4.17	8.19	3.29	1.84	1.52	1.48	30 07	30 00	212
73	William C. Newport Co., Willow Grove, Pa.	Rectified Phosphate, ...	Doylestown, ...	7.65	2.92	2.19	5.44	7.24	2.75	34 15	36 00	73
77	" " "	All-Crop Fertilizer, ...	Doylestown, ...	5.70	3.99	3.46	3.25	1.83	1.73	26 12	25 00	77
139	North West. Fertilizing Co., Chicago, Ill.,.	Ammoniated Dissolved Bone,.	Ebensburg, ...	10 95	6.26	2.87	4.04	0.77	2.06	29 18	34 00	139
140	" " "	Garden City Super Phos.,.....	Ebensburg, ...	9.25	4.31	5.70	4.50	1.06	2.30	31 88	34 00	140
226	Patapsco Guano Co., Baltimore, Md.,......	Grange Mixture, ...	Lewisburg, ...	12.53	6.96	2.88	1.84	1.95	1.61	28 34	28 00	226
157	" " "	Baltimore Soluble Phosphate,	Indiana, ...	12.81	8.44	3.28	1.32	1.84	....	17 91	20 00	157

234	" " "	Grain and Grass Producer,...	Vicksburg, ...	12.80	7.84	2.43	1.75	1.98	1.06	26 59	23 00	234
235	" " "	Coon Brand Guano, ...	Vicksburg, ...	13.25	8.04	2.13	1.34	2.39	0.92	26.05	22.00	235
236	" " "	Special Wheat Compound, ...	Vicksburg, ...	13.85	7.43	2.61	1.88	2.28	1.71	29 43	27 00	236
517	" " "	Baltimore Soluble Phosphate,	Stoyestown, ...	14.72	8.80	3.27	1.16	1.90	....	18 21	20 00	517
196	Moro Phillips Chem. Co., Philadelphia, Pa.,	C. & G. Complete Fertilizer,..	Livermore, ...	10.25	5.60	3.45	1.27	1.43	1.10	24 08	24 00	196
314	" " "	Alkaline Bone Phosphate, ...	Shamokin Dam, ...	11.00	7.57	3.90	1.25	1.98	......	17 68	17 50	314
317	" " "	Genuine Super Phosphate,. .	Pottsgrove, ...	11.77	7.40	2.55	2.24	2.40	1.90	30 54	27 00	317
442	" " "	Special Fertilizer, ...	Plumsteadville, ..	10.79	6.95	2.25	2.50	4.15	2.00	31 95	29 00	442
87	Powell Fert. & Chem. Co., Baltimore, Md.,	Red Bag Fertilizer, ...	Patton, ...	8.27	5.56	3.44	2.07	2.50	1.31	26 41	24 00	87
116	" " "	Hard Times Fertilizer, ...	Patton, ...	8.53	2.32	4.30	2.12	2.42	1.05	21 73	19 00	116
336	" " "	Hard Times Fertilizer, ...	Leechburg, ...	8.37	2.24	3.84	2.66	2.58	0.90	20 80	22 00	336
452	Pugh & Lyon, Oxford, Pa., ...	Bone Phosphate, ...	Oxford, ...	7.07	3.39	2.61	5.23	2.99	2.72	30 48	29 00	452
185	Quinnipiac Co., New York,..................	Mohawk Fertilizer, ...	Saltsburg, ...	11.34	5.30	3.75	2.05	1.31	1.02	23 82	27 00	185
186	" "	Potato Phosphate, ...	Saltsburg, ...	13.42	2.69	5.43	4.06	3.25	2.01	29 83	35 00	186
187	" "	Climax Phosphate, ...	Saltsburg, ...	12.01	5.03	3.79	2.60	2.13	1.14	25 32	30 00	187
515	" "	Potato Phosphate, ...	Rockwood, ...	13.40	1.84	7.00	4.11	2.95	2.01	30 34	35 00	515
117	Rasin Fertilizer Co., Baltimore, Md.,......	Empire Guano, ...	Carrolltown, ...	10.65	6.40	2.10	2.70	1.92	1.90	28 17	28 50	117
118	" " "	Ammoniated Alkaline Phos.,.	Carrolltown, ...	10.96	5.85	2.03	3.71	1.17	1.18	26 55	26 50	118
180	" " "	Dissolved Bone, ...	Homer City, ...	8.35	8.10	2.35	3.44	....	1.51	26 29	28 00	180
182	" " "	Bone and Potash, ...	Homer City, ...	8.85	9.29	4.64	1.28	1.55	....	19 52	21 00	182
62	The Ramsberg Fert. Co., Frederick, Md.,	Old Virginia Compound,.......	Hanover, ...	2.04	2.71	5.87	4.97	1.46	1.54	26 88	23 00	62
63	" " "	Ammoniated Bone, ...	Hanover, ...	2.78	1.33	7.74	6.05	1.15	0.53	23 11	22 00	63
150	Read Fertilizer Co., New York,.............	Standard Phosphate, ...	Marion, ...	11.55	5.71	2.96	0.95	3.53	0.96	25 03	27 00	150
151	" " "	Leader Guano, ...	Marion, ...	13.03	5.33	2.68	1.71	2.16	0.96	22 96	25 00	151
152	" " "	Farmers' Friend Super Phos.,	Marion, ...	11.95	6.83	2.05	1.71	2.00	1.97	28 62	29 00	152

COMPLETE FERTILIZERS—Continued.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Samp'e number.
527	Reading Chem. & Fert. Co., Reading, Pa.,	Neversink Fertilizer, ...	Blooming Glen, ...	3.17	4.70	3.14	5.12	2.79	2.24	31 47	30 00	527
528	" " "	A. A. Fertilizer, ...	Blooming Glen, ...	2.75	3.45	3.78	4.07	1.72	1.70	26 02	26 00	528
529	" " "	Mount Penn Fertilizer, ...	Blooming Glen, ...	2.24	2.09	4.69	2.72	0.76	1.08	20 70	21 00	529
530	" " "	Dissolved Bone, ...	Blooming Glen, ...	3.36	5.07	6.49	2.68	....	2.40	32 20	30 00	530
291	John S. Reese & Co., Baltimore, Md.,......	Half and Half Phosphate,....	Dry Valley X Roads	12.39	4.36	7.16	1.52	1.01	1.28	27 70	24 00	291
292	" " "	Wheat Special, ...	Dry Valley X Roads	9.74	2.06	8.72	3.95	0.78	....	16 46	20 00	292
328	" " "	Challenge Crop Grower, ...	Laurelton, ...	11.30	3.67	6.07	1.79	1.53	1.10	25 10	25 00	328
428	H. S. Roberts & Co., Westminster, Md.,	Pride High Grade Phos.,.....	Lahaska, ...	6.97	7.50	3.34	3.18	1.89	1.56	30 08	32 00	428
429	" " "	Big Gun Am'td Bone Phos.,..	Lahaska, ...	10.77	7.10	3.57	0 79	1.79	1.50	28 30	31 00	429
430	" " "	Leader Phosphate, ...	Lahaska, ...	7.85	5.86	3.13	1.56	0.94	0.92	22 76	25 00	430
351	Samson Fert. & Chem. Co., North East, Pa.	High Grade Fish Guano, ...	Sarversville, ...	7.34	7.97	1.94	1.73	2.14	1.08	26 88	27 00	351
203	E. A. Sharretts & Co., Baltimore, Md., ...	Standard Guano, ...	Mechanicsburg, ...	10 50	6.93	1.94	1.29	1.21	1.42	25 11	30 00	203
204	" " "	Wheat and Grass Fertilizer,.	Mechanicsburg,.....	8.55	2.75	2.76	2.82	1.26	0.95	18 94	28 00	204
295	" " "	Ammoniated Bone, ...	New Berlin, ...	10.72	1.06	4.35	1.68	1.01	0.52	15 78	22 50	295
296	" " "	Fish, Bone and Potash, ...	New Berlin, ...	10.33	2.95	4.71	1.40	0.63	0.57	18 68	17 00	296
297	" " "	Potato Fertilizer, ...	New Berlin, ...	11.23	3.11	1.59	1.78	2.59	0.69	17 76	26 00	297
228	Sharpless & Carpenter, Philadelphia, Pa.,	No. 1 Bone Phosphate, ...	Lewisburg, ...	10.84	4.68	3.94	2.87	2.41	1.01	24 79	24 00	228

88	Susquehanna Fert. Co., Baltimore, Md.,	Susquehanna Alkaline Bone,	Ebensburg,	9.56	7.04	3.91	2.51	2.07	......	17 86	24 00	88
89	" " "	Susquehanna Bone Phos.,	Ebensburg,	7.49	2.23	8.59	3.67	1.62	1.52	29 13	30 00	89
237	" " "	XXV Phosphate,	Mifflinburg,	11.53	5.79	2.54	1.77	1.09	0.80	21 70	23 00	237
238	" " "	Susquehanna Bone Phos.,	Mifflinburg,	7.10	5.01	6.14	2.84	1.37	1.30	23 33	30 00	238
390	" " "	Pure Dissolved Bone,	Sylmar,	6.15	7.48	3.36	7.29	......	2.11	31 26	27 00	390
466	" " "	Ammoniated Bone Phosphate,	Oxford,	8.22	7.38	5.74	1.57	1.58	1.34	31 12	22 00	466
470	" " "	Packing House Bone,	Oxford,	2.95	1.22	4.06	11.52	......	2.65	28 80	25 00	470
471	" " "	Potato Phosphate,	Oxford,	12 70	7 68	1.50	2.85	2.66	1.71	29 25	25 00	471
426	Taylor Privision Co., Trenton, N. J.,	High Grade C. & T. Manure,	Gardenville,	6.42	2.12	4.85	6.25	2.90	1.24	25 62	35 00	426
427	" " "	Am'd Dis. Bone & Potash,	Gardenville,	14.00	1.71	6.85	7.16	3.98	1.69	31 20	25 00	427
68	I. P. Thomas & Son Co., Philadelphia, Pa.	Special Corn Fertilizer,	Riegelsville,	8.42	3.97	6.56	2.40	8.12	......	24 01	28 00	68
69	" " "	Potato Manure,	Reigelsville,	10.80	5.12	2.57	1.54	7.23	2.82	36 26	36 00	69
71	" " "	Normal Bone Phosphate,	Reigelsville,	13.45	7.59	2.37	1.73	1.76	1.14	26 30	27 00	71
72	" " "	Improved Super Phosphate,	Reigelsville,	11.97	7.45	2.98	1.22	......	1.12	19 53	21 00	72
290	" " "	Farmers' Choice Bone Phos.,	New Columbia,	12.06	7.16	2.91	2.11	2.31	1.48	28 68	32 00	290
219	Trenton Bone and Fert. Co., Trenton, N. J.	XX Brand Fertilizer,	Doylestown,	13.96	3.88	3.61	2.84	2.87	1.62	26.32	24 00	219
220	" " "	Ammoniated Dissolved Bone,	Doylestown,	8.64	3.71	3.39	2.89	2.84	2.72	20 68	27 00	220
221	" " "	Bone Phosphate,	Doylestown,	9.17	6.06	3.37	2.65	3.05	2.45	23 02	29 00	221
224	" " "	Acid Phosphate with Potash,	New Hope,	8.63	6.49	3.21	3.58	2.72	......	17 97	20 00	224
225	" " "	Special Potato Fertilizer,	New Hope,	16 50	2.05	3.53	2.50	8.59	2.79	34.96	35 00	225
79	J. E. Tygert Co., Philadelphia, Pa.,	Popular Phosphate,	New Hope,	4.13	5.58	1.94	1.16	1.28	0.88	21 31	23 00	79
80	" " "	Bone Phosphate,	New Hope,	10.08	6.56	2.83	1.51	2.80	1.62	28.95	28 00	80
45	Tygert-Allen Fert. Co., Philadelphia, Pa.,	Ammoniated Bone Phosphate,	Littlestown,	4.96	6.28	2.91	1.40	1.26	1.02	23 77	22 00	45
209	" " "	Star Bone Phosphate,	Forest Grove,	8.00	5.64	3.09	2.50	2.63	1.81	28 69	32 00	209
210	" " "	Star Soluble Bone & Potash,	Forest Grove,	9.73	2.99	3.06	2.48	2.26	......	17 68	25 00	210

COMPLETE FERTILIZERS—Continued.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
213	" " "	Triumph Potato Guano, ...	Forest Grove, ...	11.20	3.78	2.71	1.37	8.27	3.21	37 21	40 00	213
215	" " "	Allen's Nitro Phosphate, ...	Plumsteadville, ..	8.62	6.85	2.94	1.95	2.23	1.80	29 53	33 00	215
216	" " "	Allen's Popular Phosphate,...	Plumsteadville, ...	10.45	4.89	1.78	1.45	2.16	1.11	21 72	28 00	216
217	" " "	Allen's Spec'l Potato Manure,	Plumsteadville, ...	5.90	5.06	2.63	1.29	5.10	2.60	32 83	32 00	217
445	F. K. Walt, Pennsburg, Pa.,...............	Valid Bone Phosphate, ...	Bedminsterville, ...	10.94	6.18	2.53	1.64	2.39	1.52	26 72	29 00	445
446	" "	XX Flesh Phosphate, ...	Bedminsterville, ...	8.69	5.61	2.18	2.39	2.35	1.41	25 28	24 00	446
447	" "	Complete Animal Bone Phos.,	Bedminsterville, ..	9.28	4.90	2.04	1.71	3.32	1.98	27 43	33 00	447
415	Walton & Whann Co., Wilmington, Del., ..	Cereal Bone Phosphate, ...	White Rock, ...	9.67	5.21	3.30	0.98	4.91	1.74	29 79	25 00	415
241	W. E. Whann, Atglen, Pa., ...	Spec. Potato and Truck Fert.	Millmont, ...	5.96	4.46	1.86	5.93	6.02	2.46	33 48	32 00	241
324	M. E. Wheeler & Co., New York, ...	Royal Wheat Grower, ...	Milton, ...	12.58	5.34	3.30	1.22	2.01	0.96	23 42	22 00	324
135	Wilkinson & Co., New York, ...	Economical Bone Fertilizer, .	Portage, ...	8.57	5.48	1.81	1.20	3.05	1.07	23 24	29 00	135
154	Williams & Clark Fert. Co., New York,...	Royal Bone Phosphate, ...	Indiana, ...	14.32	1.15	6.45	3.91	2.46	1.50	25 76	28 00	154
155	" " "	Prolific Crop Producer, ...	Indiana, ...	16.11	3.92	3.11	2.40	1.34	1.12	21 68	26 00	155
188	" " "	Potato, Hop and Tob. Manure,	Saltsburg, ...	13.08	2.14	5.97	3.72	3.21	2.06	29 72	35 00	188
346	" " "	Universal Am'd Dis. Bone,...	Saxonburg, ...	5.90	1.12	7.20	4.28	2.43	1.38	26 42	30 00	346
349	" " "	Americus Potato Phosphate,..	Saxonburg, ...	9.79	1.42	4.97	3.54	5.62	2.71	32 71	35 00	349
147	Emil Winter Co., Pittsburgh, Pa.,.........	Potato Fertilizer, ...	Marion, ...	3.00	3.63	5.29	3.35	2.95	1.66	29 47	27 50	147

338	" " "	Dissolved Bone with Potash,..	Leechburg, ...	3.80	5.90	5.16	5.48	2.45	2.08	34 90	34 00	338
369	" " "	Keystone Fertilizer, ...	Butler, ...	3.12	3.30	4.37	4.25	1.83	2.13	28 86	26 00	369
318	Wooldridge Fertilizer Co., Baltimore, Md.,	Quick Step Bone Phosphate,..	Pottsgrove, ...	6.36	4.55	3.11	4.61	3.10	2.36	31 04	30 00	318
319	" " "	Kangaroo Komplete Komp'd,	Pottsgrove, ...	5.36	4.41	3.87	5.05	2.33	1.71	28 36	27 00	319
320	" " "	Silver Gray, A. A. Phos.,.....	Pottsgrove, ...	4.62	1.52	4.25	7.85	2.45	1.01	23 04	24 00	320
115	Zell Guano Co., Baltimore, Md.,............	Electric Phosphate, ...	Wilmore, ...	9.04	9.10	3.66	1.33	2.26	......	19 29	22 00	115
286	" " "	Calvert Guano, ...	Kittanning, ...	14.25	8.83	2.14	1.39	2.02	0.68	25 18	23 00	286
287	" " "	Economizer, ...	Kittanning, ...	11.05	8.83	2.16	1.98	1.39	1.22	27 76	27 00	287

GROUND BONE.

Containing Phosphoric Acid and Nitrogen.

Samples Selected from August 1, 1894, to January 1, 1895.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Insoluble phosphoric acid.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
136	Allegheny City Fer. W'ks, Allegheny, Pa.,	Pure Raw Bone Meal,	Wilmore,	6.86	22.28	4.39	$30 60	$35 00	136
463	Allentown Manufact'g Co., Allentown, Pa.,	Pure Ground Bone Meal,	Oxford,	4.27	21.67	4.42	31 24	28 00	463
424	Armour & Co., Chicago, Ills.,	Ground Bone,	Brandamore,	4.50	26.60	1.97	32 14	30 00	424
383	Baugh & Sons Co., Philadelphia, Pa.,	Bone Meal,	Nottingham,	6.67	22.64	4.02	34 42	28 00	383
104	Baltimore Guano Co., Baltimore, Md.,	Raw Bone Meal,	Johnstown,	7.46	23.43	3.94	28 40	33 00	104
38	M. E. Bollinger, Sells' Station, Pa.,	Raw Bone Meal,	Hanover,	5.16	21.31	4.30	30 62	28 00	38
522	Bradley Fertilizer Co., Boston, Mass.,	Fine Ground Bone,	Somerset,	4.45	20.38	2.85	29 95	31 00	522
91	Cambria Fertilizer Co., Johnstown, Pa.,	Fine Ground Bone Dust,	Johnstown,	5.94	22.92	3.71	28 56	32 00	91
321	Chemical Co. of Canton, Baltimore Md.,	Baker's Standard Raw Bone,	Milton,	7.41	21.33	3.55	32 28	28 00	321
173	Cincinnati Dessicating Co., Cincinnati, O.,	Pure Raw Bone Meal,	Indiana,	6.46	24.60	3.64	32 29	35 00	173
175	" " "	Fine Ground Bone,	Indiana,	5.88	23.84	3.11	29 76	32 00	175
432	Crocker Chem. & Fer. Co., Buffalo, N. Y.,	Pure Ground Bone,	Doylestown,	5.84	24.91	4.04	31 18	34 00	432
199	Cumberland Co., Fertil. Co., Carlisle, Pa.,	Excelsior Raw Animal Bone,	Black Lick,	5.62	15.55	2.92	23 76	26 00	199
200	" " "	Pure Raw Animal Bone,	Black Lick,	7.90	19.80	4.31	28 35	30 00	200
412	J. G. Downward & Son, Coatesville, Pa.,	Pure Ground Bone,	Norwood,	6.94	21 35	3.89	26 54	31 00	412

124	Eureka Fertilizer Co., Perryville, Md.,	Bone Meal,	Carrolltown,	3.15	29.24	2.06	35 14	31 00	124
144	" " "	Fine Ground Bone,	Hillsdale,	6.39	22.16	3.02	37 10	32 00	144
288	" " "	Pure Ground Raw Bone,	Avondale,	6.48	22.69	3.77	28 46	29 00	288
423	" " "	Pure Ground Bone,	Kelton,	6.47	20 61	3.12	26 05	28 00	423
377	Washington Ewing, Landenberg, Pa.,	Pure Ground Raw Bone,	Nottingham,	6.39	19.63	3.40	28 11	29 00	377
17	Great Eastern Fertilizer Co., Rutland, Vt.,	Pure Fine Ground Bone,	Biglersville,	2.39	32.04	1.39	36 62	29 00	17
50	Griffith & Boyd, Baltimore, Md.,	Soft Ground Bone,	Kingsdale,	2.92	12.39	3.24	22 88	28 00	50
100	Jarecki Chemical Co., Sandusky, Ohio,	Pure Ground Bone,	Johnstown,	4.83	17.60	3.66	26 64	31 00	100
84	Kenderdine & Rice, Lumberville, Pa.,	White Bone Dust,	Lumberville,	7.77	22.60	4.37	25 18	32 00	84
161	Milsom Rend. & Fer. Co., Buffalo, N. Y.,	Cyclone Bone Meal,	Indiana,	6.59	23.21	3.50	35 62	30 00	161
99	Northwestern Fertilizer Co., Chicago, Ill.,	Raw Bone, No. 10,	Geistown,	7.40	23.44	4.12	28 14	30 00	99
138	" " "	Pure Ground Bone,	Ebensburg,	5.04	21.07	3.01	29 82	35 00	138
380	" " "	Ralston's Bone Meal,	Nottingham,	5.95	15.71	3.05	22 74	28 00	380
340	Pittsburgh Provision Co., Pittsburgh, Pa.,	Pure Raw Bone No. 2,	Leechburg,	4.58	26.53	2.90	34 84	32 00	340
4	Powell Fertilizer & Chem. Co., Balto., Md.,	Pure Bone Meal,	Biglerville,	6.50	22.63	3.91	33 82	30 00	4
453	Pugh & Lyon, Oxford, Pa.,	Raw Bone,	Oxford,	6.30	20.22	3.98	28 11	30 00	453
514	Quinnipiac Co., New York,	Uncas Bone Meal,	Rockwood,	4.27	14.86	2.56	22 77	34 00	514
94	Rasin Fertilizer Co., Baltimore, Md.,	Ground Bone,	Johnstown,	7.04	21.87	3.61	32 71	32 00	94
231	Reading Chemical Fer. Co., Reading, Pa.,	Bone Meal,	Lewisburg,	3.11	23.01	2.23	31 10	35 00	231
368	Royal Fertilizer Co., Cleveland, O.,	Royal Bone Meal,	Butler,	6.54	24.75	3.81	31 74	34 00	368
352	Samson Fer. & Chem. Co., Northeast, Pa.,	Superior Ground Bone,	Sarversville,	4.02	27.11	2.79	34 29	30 00	352
425	Scientific Fertilizer Co., Pittsburgh, Pa.,	Meat and Bone,	Allentown,	5.57	21.33	4.04	30 46	25 00	425
90	Susquehanna Fer. Co., Baltimore, Md.,	Ground Bone,	Ebensburg,	5.70	20.02	3.05	26 38	34 00	90
167	Swift & Co., Chicago, Ill.,	Pure Raw Bone Meal,	Indiana,	6.27	25.12	3.99	31 93	32 00	167
268	" "	Ground Steamed Bone,	Kittanning,	3.23	25.58	2.95	34 42	32 00	268

GROUND BONE—Continued.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Insoluble phosphoric acid.	Nitrogen.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
456	Emil Wahl, Philadelphia, Pa.,	Button Bone Dust,	Oxford,	7.41	23.98	3.94	32 04	31 00	456
370	Walker, Stratman & Co., Pittsburgh, Pa.,	Pure Raw Bone,	Butler,	5.82	22.42	3.80	29 43	30 00	370
159	Williams & Clark Fertilizer Co., New York,	Americus Bone Meal,	Indiana,	4.86	21.19	2.82	29 22	32 00	159
496	" " "	Carteret Bone Meal,	Chadd's Ford Junction,	4.72	15 32	2.19	22 58	28 00	496
148	Emil Winter Co., Pittsburgh, Pa.,	Pure Raw Bone,	Marion,	3.82	21.36	3.36	32 11	30 00	148
339	" "	Crescent Raw Bone,	Leechburg,	3.17	16.33	2.67	25 29	30 00	339
178	Wooldridge Fertilizer Co., Baltimore, Md.,	Pure Raw Bone,	Indiana,	7.23	21.97	3.58	32 92	32 00	178
114	Zell Guano Co., Baltimore, Md.,	Pure Ground Raw Bone,	Wilmore,	6.69	21.05	3.74	28 68	32 00	114

ACIDULATED SOUTH CAROLINA ROCK.

Containing Phosphoric Acid Only.

Samples Selected from August 1, 1894, to January 1, 1895.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Total phosphoric acid.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
106	Baltimore Guano Co., Baltimore, Md.,	Dissolved Bone Phosphate,	Johnstown,	7.50	8.52	5.40	0.95	14.87	$16, 35	$18 00	106
177	" " "	Farmers' Dissolved Bone,	Indiana,	10.45	9.79	3.76	2.22	15.77	16 82	16 00	177
181	Bowker Fertilizer Co., Boston and N. Y.,	Super Phosphate,	Homer City,	4.55	9.54	3.11	4.45	17.10	18 39	22 50	181
111	Bradley Fertilizer Co., Boston, Mass.,	Dissolved Bone,	Wilmore,	5.97	9.76	5.34	1.11	16.21	17 59	20 00	111
37	A. R. Brodbeck, Hanover, Pa.,	Soluble Bone Phosphate,	Hanover,	4.05	10.25	4.47	2.93	17.65	18 20	17 00	37
59	S. B. Brodbeck, Brodbecks, Pa.,	Ruth's Dissolved Bone,	Hanover,	1.86	12.91	3.90	1.37	18.18	19 53	14 50	59
60	" "	Dissolved S. C. Bone,	Hanover,	2.99	12.50	4.25	0.71	17.46	19 11	14 00	60
122	Chemical Co. of Canton, Baltimore, Md.,	Gem Phosphate,	Carrolltown,	5.17	8.08	5.99	1.43	15.50	16.69	16.00	122
166	" "	Baker's Dis. Bone Phosphate,	Indiana,	6.47	11.83	3.62	1.49	16.94	18 32	16 00	166
232	" "	Pure Dissolved S. C. Bone,	Lewisburg,	9.54	11.28	3.06	1.90	16.24	17 53	14 00	232
9	Chesapeake Guano Co., Baltimore, Md.,	Dissolved Bone Phosphate,	Asper's Station,	1.96	12.21	4.72	1.02	17.95	19 36	15 00	9
490	" "	Dissolved Bone Phosphate,	Fairville,	7.78	11.04	4.28	1.48	16.80	18 12	13 50	490
409	E. A. Clendennin & Bro., Colora, Md.,	High Grade Acid Phosphate,	Fairmount;	6.62	9.42	3.05	1.87	14.34	15 70	14 50	409
378	Henry Cope & Co., Lincoln University, Pa.,	Acid Phosphate,	Nottingham.	6.85	7.11	5.78	3.24	16.73	16 45	12 50	378

ACIDULATED SOUTH CAROLINA ROCK—Continued.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Total phosphoric acid.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
398	Josiah Cope & Co., Lincoln University, Pa.,	Acidulated Phosphate,	Eldora,	5.32	10.97	3.24	2.37	16.58	17 60	13 50	398
231	E. Frank Coe Co., New York,	Soluble Bone,	Kittanning,	3.37	7.33	3.81	4.98	16.12	15 82	20 00	231
486	J. A. Cranston Co., Newport, Del.,	Horse Shoe Soluble Bone,	Kennett Square,	3.49	7.75	4.67	4.63	17.05	16 78	13 50	486
202	Cumberland Co., Fer. Co., Carlisle, Pa.,	Acid Phos. for Wheat, etc.,	Black Lick,	7.07	9.46	3.89	1.71	15.06	16 36	16 50	202
34	Wm. Davison & Co., Baltimore, Md.,	Dissolved S. C. Bone,	Hanover,	3.62	11.43	4.18	2.77	18.38	19 04	15 00	34
42	Detrick Fer. & Chem. Co., Baltimore, Md.,	Dissolved S. C. Bone,	Dutra Station,	6.53	11.84	3.81	1.06	16.71	18 27	14 00	42
413	Jas. G. Downward & Son., Coatesville, Pa.,	Acid Phosphate,	Norwood,	4.33	8.92	5.02	2.58	16.52	17 19	15 00	413
129	Eureka Fertilizer Co., Perryville, Md.,	P. & P. Super Phosphate,	Bradley Junction,	8.47	8.82	2.99	4.28	16.09	16 23	17 00	129
239	" "	Dissolved S. C. Rock,	Avondale,	9.19	10.89	3.94	1.33	16.16	17 61	14 00	239
422	" "	P. & P. Super Phosphate,	Kelton,	13.45	10.24	4.05	0.83	15.12	16 83	14 00	422
394	W. S. Farmer & Co., Baltimore, Md.,	Pure Dissolved S. C. Bone,	Peach Bottom,	8.72	11.28	3.96	1.02	16.26	17 85	12 25	394
536	Mahlon Fretz, Sellersville, Pa.,	Dissolved Bone,	Sellersville,	6.55	9.69	5.74	1.16	16.59	17 90	21 00	536
531	Great Eastern Fer. Co., Rutland, Vt.,	Dissolved Bone,	Richlandtown,	5.83	11.66	4.50	0.95	17.11	18 62	22 00	531
240	Griffith & Boyd, Baltimore, Md.,	High Grade Acid Phosphate,	Millmont,	11.48	11.26	2.30	1.62	15.18	16 72	14 00	240
537	H. F. Hager, Quakertown, Pa.,	Soluble Bone,	Quakertown,	5.62	8.61	7.75	1.20	17.56	18 55	19 00	537
243	S. M. Hess & Bro., Philadelphia, Pa.,	Acid Phosphate,	New Columbia,	10.92	7.63	8.07	1.06	16.76	17 82	15 00	243
29	Hubbard & Co., Baltimore, Md.,	High Grade Sol. S. C. Phos.,	Hanover,	3.30	10.68	4.86	1.68	17.22	18 34	16 00	29

308	" "	High Grade Sol. S. C. Phos.,	Middleburg, ...	5.70	11.81	3.57	0.75	16.13	17 90	17 00	308
141	Jarecki Chemical Co., Sandusky, O.,.......	C. O. D. Phosphate, ...	Carrolltown, ...	4.27	2.58	8.54	2.18	13.30	13 94	24 00	141
179	Maryland Fertilizing Co., Baltimore, Md.,.	Dissolved S. C. Bone, ...	Indiana, ...	11.41	11.44	2.94	1.14	15.52	17 20	17 00	179
300	" " "	Dissolved Phosphate, ...	Middleburg, ...	10.52	11.04	2.66	2.00	15.70	17 00	16 50	300
506	McCalmont & Co., Bellefonte, Pa.,.........	High Grade Acid Phosphate,..	State College, ...	7.37	11.60	3.44	0.93	15.97	17 67	15 00	506
27	F. Mehring, Bruceville, Md., ...	Acid Phosphate, ...	Littlestown, ...	5.02	11.56	4.33	2.38	18.27	19 08	15 00	27
165	Milsom Rend. & Fer. Co., Buffalo, N. Y.,.	Pure Dissolved Bone, ...	Indiana, ...	6.12	6.64	3.08	2.93	12.65	18, 30	21 00	165
158	Patapsco Guano Co., Baltimore, Md.,......	Pure Dissolved S. C. Phos.,..	Indiana, ...	9.22	11.02	4.01	1.00	16.03	17 65	16 00	158
518	" " "	Pure Dissolved S. C. Bone,...	Jenner's X Roads, ...	10.61	10.80	3.97	0.96	15.73	17 37	16 00	518
193	Moro Phillips Chemical Co., Philada., Pa.,	Soluble Bone Phosphate, ...	Saltsburg, ...	7.77	9.81	4.16	1.46	15.43	16 82	19 00	193
196	" " "	Dissolved Phosphate, ...	Livermore, ...	5.25	7.66	4.68	1.66	14.00	15 28	15 00	196
511	" " "	Soluble Bone Phosphate,......	State College, ...	4.55	11.41	4.33	1.22	16.96	18 38	14 00	511
137	Powell Fert. & Chem. Co., Baltimore, Md.,.	Dissolved S. C. Bone, ...	Belsano, ...	6.63	9.66	4.28	1.38	15.32	16 75	18 00	137
146	The Quinnipiac Co., New York, ...	Soluble Dissolved Bone, ...	Gipsey, ...	7.25	9.08	4.81	0.78	14.67	16 33	17 00	146
61	Ramsberg Fertilizing Co., Frederick, Md.,.	Dissolved Bóne Phosphate,....	Hanover, ...	6.77	6.75	7.09	2.06	15.90	16 63	16 00	61
95	Rasin Fertilizer Co., Baltimore, Md., ...	Acid Phosphate, ...	Johnstown, ...	6.01	10.26	4.53	1.28	16.07	17 47	20 00	95
149	Read Fertilizer Co., New York,............	Dissolved Bone Phosphate,....	Marion, ...	9.55	8.37	4.41	1.42	14.20	15 61	17 00	149
244	" "	Acid Phosphate, ...	Apollo, ...	5.27	4.30	4.78	3.53	12.61	13 04	16 00	244
270	John S. Reese & Co., Baltimore, Md.,....	Dissolved Bone Phosphate,....	Kittanning, ...	10.30	8.33	4.86	1.06	14.25	15 80	20 00	270
326	" "	Elm Phosphate, ...	Laurelton, ...	6.07	8.16	6.73	2.75	17.64	18 02	19 00	326
464	Susquehanna Fertil'g Co., Baltimore, Md.,	Superior Rock Phosphate,....	Oxford, ...	1.87	10.36	4.46	2.50	17.32	18 08	13 50	464
505	" " "	Soluble Bone Phosphate, ...	Milheim, ...	3.47	12.55	2.88	1.35	16.78	18 33	21 00	505
70	I. P. Thomas & Son Co., Philada., Pa.,..	Waring's P. & P. Super Phos.,	Reigelsville, ...	2.45	9.74	4.59	3.09	17.42	17 89	19 00	70
334	" " " ..	S. C. Phosphate, ...	Watsontown, ...	8.20	6.97	5.19	3.75	15.91	16 04	14 00	334
497	J. E. Tygert Co., Philadelphia, Pa.,........	Acid Phosphate, ...	Chadd's Ford Junction, ..	3.67	9.50	3.41	1.31	14.22	15 80	13 00	497

ACIDULATED SOUTH CAROLINA ROCK—Continued.

Sample number.	Name and Address of Manufacturer.	Name of Fertilizer.	Where Selected.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Total phosphoric acid.	Comparative commercial value per ton.	Selling price at point of selection per ton.	Sample number.
47	Tygert-Allen Fertilizer Co., Philada., Pa.,	Star Dissolved Bone Phos.,...	Littlestown, ...	3.37	9.70	6.82	1.12	17.64	18 78	14 00	47
130	" " "	Dissolved S. C. Rock, ...	Bradley Junction, ...	5.25	4.19	8.30	2.23	14.72	15 26	17 00	130
55	Walton & Whann Co., Wilmington, Del.,	Dissolved Bone Phosphate, ...	Hanover, ...	3.32	7.33	6.89	2.67	16.89	17 32	16 00	55
298	" " "	*Diamond Soluble Bone, ...	New Berlin, ...	14.87	7.51	4.81	1.57	13.89	*17 86	18 00	298
417	" " "	Dissolved Bone Phosphate,....	White Rock, ...	4.47	12.05	3.04	1.78	16.87	18 18	13 50	417
194	Joshua Walker, Baltimore, Md., ...	Dissolved S. C. Phosphate,...	Saltsburg, ...	7.35	11.00	3.70	1.29	16.00	17 49	19 00	194
322	M. E. Wheeler & Co., New York, ...	Electrical Dissolved Bone,....	Milton, ...	4.24	6.68	4.36	3.95	14.99	15 19	20 00	322
153	Williams & Clark Fertilizer Co., N. Y.,..	Acorn Brand Acid Phosphate,.	Indiana, ...	8.65	8.88	3.82	2.50	15.20	16 14	16 00	153
546	M. A. Winter, Alexandria, Va., ...	Natural Plant Food, ...	Meadville, ...	4.17	0.00	1.02	17.02	18.04	12 25	17 00	546
113	Zell Guano Co., Baltimore, Md., ...	Dissolved S. C. Phosphate,....	Wilmore, ...	6.72	10.58	3.94	1.38	15.90	17 35	16 00	113
131	" " "	Dissolved Bone Phosphate,...	Bradley Junction, ...	7.00	11.32	3.07	1.29	15.68	17 24	18 00	131

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*Includes 0.62 per cent. nitrogen, $2.22.

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MINUTES OF THE TRANSACTIONS

OF THE

Pennsylvania State Agricultural Society.

1894.

PROCEEDINGS OF THE EXECUTIVE COMMITTEE.

Tuesday evening, January 16, 1894.

In conformity with an old established custom a regular stated meeting of the Executive Committee of the Pennsylvania State Agricultural Society was held in the Society's office, at 5 o'clock p. m. to-day.

The usual hour, however, for this meeting in former years was 7.30 p. m., but Mr. Rutherford, treasurer, who was suffering with neuralgia, thought it would be imprudent for him to be out in the night air. Mr. Bergner had a prior meeting at 7.30 p. m., and feeling that we could not have a quorum present at 7.30, Mr. McDowell called the meeting to order at 5.00 o'clock, as above. Members present, John McDowell, president; W. F. Rutherford, treasurer; Hon. David H. Branson, first vice president; Charles H. Bergner, vice president; and J. Schall Wilhelm, secretary, and Alonzo E. Brady was also present.

The minutes of the previous meeting of the Executive Committee of the Pennsylvania State Agricultural Society for the meeting held January 17, 1893, were read and approved.

Mr. McDowell gave a brief outline, of the work being done in connection with our claim against the United States Government for reimbursing this society for money expended in holding a National Sheep Show in the city of Philadelphia in the year 1880. Mr. McDowell's statement brought forth a great deal of comment upon the subject, which was discussed by Mr. Branson, Mr. Bergner, Mr. Rutherford and Mr. Wilhelm. It was finally agreed to refer the matter to the incoming board for action.

Mr. Rutherford, treasurer, presented his report for the year, which was read by Secretary Wilhelm, and upon motion of Mr. Branson, seconded by Mr. Bergner, the report was received and directed to be presented at the annual meeting of the society on the morrow.

Mr. Bergner offered the following resolution:

"That the incoming duly authorized president of the society be empowered, in conjunction with the secretary and treasurer, in making up a ticket to be balloted for on the morrow."

Which was seconded by Mr. Branson and agreed to.

Mr. Bergner also offered the following resolution:

Resolved, That Col. Hiram Young, of York, Pa., be tendered the honor of presiding at the annual meeting of the society to-morrow.

Which was seconded by Mr. Rutherford and unanimously agreed to.

Mr. Bergner, chairman of the committee on location, made the following report:

"That a few weeks ago the secretary received an invitation from Mr. J. C. Thornton, one of the vice presidents of the society, residing at Erie, requesting that the committee on location visit Erie at the earliest day practicable with a view to entering into satisfactory arrangements for holding an exhibition. After some little correspondence upon the subject it was decided that the committee on location visit Erie, and be enabled to make an intelligent report at this meeting, but in this, however, we have been somewhat handicapped.

"When the time arrived for going to Erie Mr. Rutherford was suffering with a severe attack of neuralgia, and did not think it prudent for him to be away from home at that time; that Mr. Wilhelm was also unable to accompany him on account of the illness of Mrs. Wilhelm. Mr. Bergner reported that he alone visited Erie. Upon his arrival he was received with the greatest courtesy upon the part of the Erie County Agricultural Society, and was taken to the grounds where they proposed inviting the State fair to locate.

"The grounds contain about seventy acres and is located upon one of the farms or estate of the late Hon. W. L. Scott. The farm, originally, was intended as a farm for the breeding of horses exclusively, the buildings on the farm all being erected for this purpose, and the best of the various kinds. Mr. Bergner reported that with very little expense, possibly an outlay of $300 to $500 would be sufficient for changing the buildings, making them suitable for holding a State fair.

"Located on the tract is a three-quarter mile track; this they agree to change to a half-mile track, and erect a grand stand, the size of which to be determined upon hereafter. They also agree to leave us have the grounds free of charge, and were very anxious to have the State fair locate at Erie this coming year.

"Ingress and regress to and from the grounds is by electric car, also by boat along the lake; this latter route Mr. Bergner was of opinion would carry the greatest number of visitors from the interior.

"The terms for holding the fair was discussed by Mr. Bergner and the Erie people, but no definite conclusion arrived at; the only thing was that they appeared most anxious for the State fair to be held there, and would agree to almost anything."

Upon Mr. Bergner's return he called a meeting of the committee on location, at which time Mr. Bergner stated his conversation with the Erie people, similar to the above, and after considerable discussion it was decided that the secretary should mail Mr. Thornton the following proposition from the committee on location, as follows, which was read by the secretary:

Harrisburg, Pa., January 12, 1894.

J. C. Thornton, Esq., Avonia, Erie county, Pa.:

My Dear Sir: Mr. Bergner returned from Erie on Tuesday last, but owing to the illness of Mr. Rutherford, the committee was unable to meet until to-day. This will explain the delay of the few days. The committee is of opinion that Erie is the place to hold the State fair this year, and were thoroughly satisfied with the report made by Mr. Bergner as to the place of holding the same. The committee believes that a proposition like the following is the best that can be suggested for both your local society and our State society:

1st. Your society to furnish the grounds free of rent with all the buildings prepared and in order for show purposes, including a grand stand for the race track. The expenditure necessary for this we assume you can easily raise by local subscription.

2d. That the fair be held upon a date to be agreed upon, under the auspices of the State society, and to be under the supervision of an executive committee composed of three members from each society, the executive officers of the State society to be in nominal charge of the fair and to have control of the management of the exhibition subject to the advice of the aforesaid executive committee.

3d. That the expense of holding the exhibition shall be shared equally by the two societies, and the profits, if any, divided equally between the two societies.

The above, in brief, is what our committee on location thinks would be advantageous for both parties, and personally I think the above suggestion is a good one. Of course, the matter is outlined very briefly above, but the proposition can easily be elaborated into details without in any way destroying the essential parts of the proposition above made.

Very truly yours,
(Signed.) J. SCHALL WILHELM,
Secretary.

No reply has been received to this letter as yet.

Mr. Bergner then asked that the executive committee ratify or endorse the action of the committee on location.

Upon motion of Mr. Branson the action of the committee on location was approved, and directed that this matter be presented to the incoming board on the morrow.

Which was unanimously agreed to.

The subject of judge and tellers for the holding of the election to-morrow, as well as auditors for the treasurer's report, was then discussed, and it was finally agreed to leave this matter open for the chairman of the meeting to announce.

On motion adjourned.

J. SCHALL WILHELM,
Secretary.

PROCEEDINGS OF THE EXECUTIVE COMMITTEE.

Harrisburg, Pa., January 17, 1894.

The executive committee met in regular session at 2.00 o'clock p. m., President McDowell in the chair.

Mr. McDowell. The hour has now arrived to hold this meeting, and we are now ready for business; we might now hear the report of the committee on resolutions; which report was then read by Mr. A. P. Young, as follows:

"Whereas, We have learned with regret of the death of D. J. Waller, an eminent citizen of Columbia county, a life member of this society, and for a long time one of its vice presidents; therefore

"Resolved, That as a body representing the agricultural interests of the State, we recognize the fact that this society, the community among whom he lived, and the State, have sustained great loss, the cutting down of one, even at the advanced age he had reached, but whose energy was untiring, whose enterprise was the admiration of his neighbors, and whose liberality contributed so largely to the industrial, educational, religious and social development of his town, his county, and the State can only be viewed with regret. His was a broad and liberal nature. Educated for the ministry of the Presbyterian church, he labored actively as a pastor nearly his whole life, yet he found time for business enterprises, for agricultural pursuits, and to take a hand in any work that promised to elevate humanity. May others emulate his example.

"Resolved, That this preamble and resolution be spread upon the minutes and a copy sent to the family of the deceased.

A. P. YOUNG,
JOHN McDOWELL,
T. A. CORRELL.

Mr. Wilhelm moved that the report be received, adopted and filed.

Seconded by Dr. Correll and agreed to.

Mr. McDowell then announced the following committees:

Committee of Arrangements: John McDowell, president; W. F. Rutherford, treasurer; J. Schall Wilhelm, secretary; David H. Branson, Charles H. Bergner and J. C. Thornton.

Committee on State Legislation: David H. Branson, chairman; C. H. Bergner and W. F. Rutherford.

Congressional Committee: John McDowell, president; James S. McKean, C. H. Bergner, J. Schall Wilhelm and W. F. Rutherford.

Committee on Location: Charles H. Bergner, chairman; W. F. Rutherford, David H. Branson and J. Schall Wilhelm.

Committee on Finance: J. Schall Wilheim, chairman; W. F. Rutherford and C. H. Bergner.

Committee on Printing: J. Schall Wilhelm, W. F. Rutherford and J. C. Thornton.

Committee on grounds: David H. Branson, chairman; J. C. Thornton and J. Schall Wilhelm.

Mr. McDowell: The State Board of Agriculture will hold its annual meeting in the supreme court room next week; this society is entitled to two or three delegates, which I think proper we should send.

Mr. Wilhelm moved that the president be empowered to appoint these delegates, which was seconded by Dr. Correll and agreed to.

The president accordingly appointed Messrs. Branson, Hiram Young and Dr. Correll to represent the society in the State Board of Agriculture next week. Mr. Young asked to be excused, as it would be impossible for him to attend, which was granted.

Upon the withdrawal of Mr. Hiram Young, Mr. A. P. Young was appointed in his place as one of the representatives to the meeting of the State Board of Agriculture next week.

Mr. Wilhelm also moved that representatives be appointed to attend the meeting of the agricultural societies week after next; whereupon, President McDowell appointed as this committee, Messrs. Hiram Young, Branson and S. B. Rutherford.

Mr. Branson: Mr Chairman, I certainly appreciate all the honors you have conferred upon me to-day by being connected with these various committees, but you must understand clearly that I am not a member of the executive committee of this society, but my feelings are always in the interests of agriculture all the time, although defeated to-day for the presidency; I have no feelings in this matter, and I sincerely appreciate these honors you have conferred upon me to-day, yet I am not a member of the executive committee of the Pennsylvania State Agricultural Society; however, I am in entire sympathy with it, and hope and wish for it grand and good results, and if you think it is entirely consistent that I shall be placed upon these committees, I shall endeavor to do my part, and shall try and do all I can for this society, and anything that I can do for its promotion I shall be glad to do.

Mr. McDowell: I must say that it is magnanimous on the part of Mr. Branson to speak thus, and I think the president has full power to make this appointment, and shall be glad to have you serve on these committees as appointed, and we shall be glad to have your counsel all through.

Mr. Branson: I might again simply state that I have no grievances against the society, and I feel that this has been a square and open election.

I have been to the World's Fair; at first I was unsuccessful, but secured a position and was paid for the time lost. I was appointed judge upon two different strains of cattle, and acted in various other capacities. We took with us products for exhibition from Chester county, cereals, corn and oats; Pennsylvania competed against the world, and we came home with our banner flying. We got the ribbons from the exhibition for the first premium on corn and oats, and there will have to be another World's Fair before that honor can be taken from Pennsylvania. It was not a county fair, nor a State fair, it was a competition against the world.

Mr. Branson was then congratulated by members present on securing first premium at World's Fair for corn and oats.

President McDowell appointed Dr. B. H. Warren, of West Chester, Pa., as mammalogist and ornithologist of the society; he also appointed Thomas M. Jones as press representative.

On motion adjourned, to meet at the call of the president.

J. SCHALL WILHELM,
Secretary.

MEETING OF THE SOCIETY.

The society met at 10 o'clock a. m., Wednesday, January 17, 1894.

On motion of Mr. Wilhelm, seconded by Mr. Rutherford, Mr. Young, of York, was unanimously elected chairman of the meeting. Mr. Young thereupon took the chair and briefly thanked the society for the honor conferred upon him.

Mr. Wilhelm moved that a committee of three be appointed by the chair to conduct the election for officers of this society for the ensuing year, which was seconded by Mr. Branson and agreed to. The chair thereupon appointed Mr. A. P. Young, judge, and Messrs. S. B. Rutherford and H. M. Koller, tellers.

Mr. A. P. Young: Mr. Chairman, before proceeding with this election it may be proper for me to say, that in glancing over the ticket that has been placed in my hands, I find the name of D. J. Waller on that ticket as candidate for vice-president of this society. I regret to say that D. J. Waller is dead, and was buried last December, and to confirm what I say I will read to you a couple of clippings that I took from the county papers at the time of his death in order to give you some estimation of the high esteem in which he was held by his fellow citizens.

Mr. Young then read a few clippings, which he had taken from the county papers.

Mr. Hiram Young: It may be necessary to make some provision to fill Mr. Waller's place.

Mr. Wilhelm then offered the following resolution:

"That the name of A. P. Young be substituted in the place of D. J. Waller in the 11th district, and that any votes cast for Mr. Waller be counted for Mr. Young," Seconded by Mr. Branson and agreed to.

During the balloting the following business was transacted:

Mr. Wilhelm moved that an auditing committee of three be appointed by the chair to examine the report of Treasurer Rutherford.

Chairman Young announced as the auditing committee, Hon. D. H. Branson and B. P. Thompson.

After some time, the auditing committee presented their report as follows:

Dr.

W. F. Rutherford, Treasurer, in account with Pennsylvania State Agricultural Society.

1893.			
Jan. 21.	To balance on hand,		$79 27
Jan. 24.	To State appropriation,		2,000 00
	Proceeds of joint exhibition held at Indiana, Sept. 11th to 15th, 1893, with Indiana County Society,		
	Sale of tickets,	$8,648 75	
	Sale of privileges,	826 19	
	Entry fees,	783 80	
	Total,	$10,258 74	
	Our one-half share of above amount,		5,129 37
	Due Treasurer,		7 03
			$7,215 67

Cr.

1893.		
Order No. 1, J. S. Wilhelm, amount due him on settlement for '92,		$274 11
Order No. 18, and 2, J. S. Wilhelm, secretary, salary for 1892,		300 00
Order No. 18 and 3, Additional expenses at Lancaster,.		500 00
Order No. 4 and 12, J. Q. Overmiller, stenographer,.....		75 80
Order No. 5 and 14, J. S. Wilhelm, advertising and expenses,		260 92
Order No. 6, 8, 11 and 17, rent of office at Harrisburg,...		120 00
Order No. 7, Hammond and Bailey, insurance,.........		15 00
Order No. 9, expenses secretary's office,		150 00
Order No. 10, J. S. Wilhelm, secretary, salary and expenses, 1893,		300 00
Order No. 13, W. F. Rutherford, treasurer, expenses of committee on location,		65 47
Order No. 15, C. H. Bergner, services and expenses,....		50 00
Order No. 16, W. F. Rutherford, part payment of salary,.		75 00
Payments made by joint committees at Indiana, Pa.		
For races,	$785 00	
For Association of Trotting Horse Breeders,	400 00	
For premiums,	4,027 50	
For printing,	622 45	
For music,	189 13	
For judges,	257 62	
For hay, straw and oats,	399 07	
For bicycle show,	306 11	
For labor, material and incidentals,.....	1,111 63	
To Indiana Society as per agreement,...	2,000 00	
To Indiana Society for new building,...	160 22	
	$10,258 73	
Our half share of above expenses,		5,129 37
		$7,215 67

We, the undersigned auditors, appointed by the Pennsylvania State Agricultural Society, to audit the account of W. F. Rutherford, Treasurer, beg leave to State that after having examined the charges and vouchers we find the same correct, as above stated.

Witness our hands this 17th day of January, 1894.

DAVID H. BRANSON.
B. P. THOMPSON.

On motion of Secretary Wilhelm, the report was received, approved and filed, and directed that it be entered upon the minutes.

Mr. McDowell moved that a committee of three be appointed by the chair to draft resolutions relative to the death of Dr. Waller, an eminent vice president of this society, also that Mr. A. P. Young be chairman of that committee. Seconded and agreed to.

The chair appointed as this committee Messrs. Young, McDowell and Dr. Correll.

Secretary Wilhelm then offered the following resolution:

That General D. H. Hastings, Hon. John B. Robinson, Hon Giles D. Price, Hon. J. C. Sibley and Hon. Thos. J. Stewart be made honorary life members of this society. Seconded by Dr. Correll and unanimously agreed to.

Secretary Wilhelm: In the absence of Charles H. Bergner, Esq., the chairman of the committee on location, I would like to say, that a few weeks ago we received an invitation from Mr. J. C. Thornton, one of the vice presidents of the society residing at Erie, requesting that the committee on location visit Erie at the earliest day practicable with a view to entering into satisfactory arrangements for holding an exhibition; after some little correspondence upon the subject it was decided that the committee on location visit Erie, and be enabled to make an intelligent report at this meeting, but in this, however, we have been somewhat handicapped.

When the time arrived for going to Erie, Mr. Rutherford was suffering with a severe attack of neuralgia, and did not think it prudent for him to be away from home at that time; and I was also unable to accompany him on account of the illness of Mrs. Wilhelm. Mr. Bergner reported that he alone visited Erie; upon his arrival he was received with the greatest courtesy upon the part of the Erie County Agricultural Society, and was taken to the grounds where they proposed inviting the State Fair to locate.

The grounds contain about 70 acres and is located upon one of the farms or estate of the late Hon. W. L. Scott. The farm originally was intended as a farm for the breeding of horses exclusively, the buildings on the farm all being erected for this purpose, and the best of the various kinds. Mr. Bergner reported that with very little expense, possibly an outlay of $300 to $500, would be sufficient for changing the buildings, making them suitable for holding a State Fair.

Located on the tract is a three-quarter mile track, this they agree to change to a half mile track, and erect a grand stand, the size of which to be determined upon hereafter. They also agree to leave us have the grounds free of charge, and were very anxious to have the State Fair locate at Erie this coming year.

Ingress and regress to and from the grounds is by electric car, also by boat along the lake; this latter route Mr. Bergner was of opinion would carry the greatest number of visitors from the interior.

The terms for holding the fair was discussed by Mr. Bergner and the Erie people, but no definite conclusion arrived at; the only thing was that they appeared most anxious for the State Fair to be held there, and would agree to almost anything.

Upon Mr. Bergner's return he called a meeting of the committee on location, at which time Mr. Bergner stated his conversation with the Erie people similar to the above, and after considerable discussion it was decided that the secretary should mail Mr. Thornton a proposition from the committee on location stating the terms under which we would hold a fair at Erie.

I think some action should be taken endorsing this committee.

Mr. Young: What action should be taken?

Mr. Rutherford: The society can do no more than recommend or approve of it; there can be nothing further done.

Mr. Rutherford moved that the society approve of the step taken by the committee on location. Seconded by Mr. McDowell and agreed to.

The hour of 12 o'clock having arrived the polls were declared closed, and the officers appointed to conduct the election made the following report:

President.

John McDowell,	41
David H. Branson,	15

First Vice President.

J. C. Thornton,	56

Vice Presidents.

1. George Handy Smith,	56
2. Thomas J. Jordan,	56
3. Benj. S. Kunkle,	56
4. Chas. E. Voorhees,	56
5. L. H. Twaddell,	56
6. J. P. Jackson,	56
7. William H. Holstein,	56
8. George D. Stitzel,	56
9. William Taylor,	56
10. B. J. McGrann,	56
11. A. P. Young,	56
12. H. H. Colvin,	56
13. A. D. Hay,	56
14. Gabriel Hiester,	56
15. Joseph Piollet,	56
16. Joel A. Herr,	56
17. Henry Nesbit,	56
18. John S. Miller,	56
19. Hiram Young,	56
20. John A. Lemon,	56
21. George Rhey,	56
22. W. W. Speer,	56
23. James McKean,	56
24. John Biesecker,	56
25. J. D. Kirkpatrick,	56
26. J. C. Thornton,	56
27. William Powell,	56
28. John A. Woodward,	56

At Large.

Thomas J. Edge,	56
James Young,	56

Additional Members Executive Committee.

C. H. Bergner,	56
John H. Ziegler,	56
S. B. Rutherford,	56
H. C. Demming,	56
E. K. Myers,	56

Ex-Presidents, Members of the Board.

A. Boyd Hamilton,	56
John McDowell,	56

Corresponding and Recording Secretary.

J. Schall Wilhelm,	56

Treasurer.

W. F. Rutherford,	56

Chemist and Geologist.

A. L. Kennedy,	56

Librarian.

William H. Egle,	56

Stenographer.

J. C. Overmiller,	56

A. P. YOUNG, Judge.
S. B. RUTHERFORD, Teller.
H. M. KOLLER, Teller.

Mr. McDowell moved that a vote of thanks be extended to the gentlemen who conducted the election, which was seconded and agreed to.

Mr. McDowell was then conducted to the chair and addressed the society as follows:

Gentlemen of the Pennsylvania State Agricultural Society: It is with feelings of profound respect for the high appreciation of the honor you have again shown me by your suffrage in again reelecting me as your president for another term. May I not infer from this that my services as president in former years has been acceptable.

Let us not be discouraged, the history of our country shows a financial panic about every twenty years, the present is perhaps the severest we have ever had. The various industries cannot remain paralyzed. Our citizens are live active men; while many are or have been embarrassed, they will recover, business will revive.

Agriculture is the oldest and most substantial industry, not only so, but it is the most important as it is the foundation for the prosperity of all other industries; the three essentials of life come from mother earth; our food, our raiment and our warmth; our food from the pure soil; the water we drink trickles from the pure rock, and the minerals furnish our fuel.

Our pioneer fathers turned the wilderness into fruitful fields and planted her soil. The struggle was hard tramping through brush without roads, without house or hut to shelter in. The bow and the arrow of the skulking Indian, the wild beasts of the desert a constant menace to progress. These were hardships of 100 years ago; the sacrifice was extremely great, where are they now, gone to come no more.

Now we have bequeathed us a beautiful country, a land of peace, a land of milk and honey, a land of churches, schools and colleges, glorious institutions. A State of great diversified industries that gives employment to its citizens. While we are now passing through a panic, those that are idle will soon find employment. We must plow and sow the soil ever ready to respond to the hand of the cultivator, and the products of the soil yielding food for man and beast, when grouped together with improved machinery and improved stock, and exhibited at our fairs, all of which has a tendency to encourage industry. Therefore let us not despond, there is room and work in this wide world for all, it is true we are passing through a transition state, soon the fires will be lit up, let us all go to work and beautify our homes, improve our stock and prepare exhibits for our next State Fair, and there may we all make friends and acquaintances whose memories will go with us through life.

In conclusion I earnestly ask the cordial co-operation of you all.

On motion the society adjourned.

J. SCHALL WILHELM,
Secretary.

(Copy.)

Harrisburg, Pa., April 24, 1894.

President State Agricultural Society:

Dear Sir: I have the honor to report to you that on January 17, 1894, I was re-elected Secretary of the Pennsylvania State Agricultural Society for the current year, by a unanimous vote.

In the constitution and by-laws of this society setting forth the duties of its officers, I find the following under the head of its secretary, viz:

"The duty of this officer shall be to invite a correspondence with all persons interested in agriculture, whether in the State of Pennsylvania or elsewhere, that new seeds, vegetables, or live stock may be introduced, and their fitness for cultivation and propagation in our climate be tested. At each stated meeting of the society, he shall read his correspondence, which shall, either the whole, or such parts as may be selected by the society, form a portion of the transactions. He shall also correspond with the president or other officers of each State society in the United States, for the purpose of combined and mutual action, and to be informed of the results and progress of each other's efforts; also, to invite mechanics to forward models or implements for examination or trial."

I had the pleasure some time ago of mailing to your address our annual report, which contained the interesting correspondence I had last year upon this subject.

I now write to ask:

1st. What new steps, if any, have been taken by your society for the development of this great industry—agriculture?

2d. What new attractions are you going to have for this year's fair?

3d. When and where will you hold your fair this year?

4th. What admission do you charge?

5th. What is your average daily attendance?

6th. Will you kindly mail me copy of your premium list for this year? I will be glad to mail you copy of ours as soon as it is out of the hands of the printer.

7th. Have you any new suggestions for our mutual benefit?

Be pleased to hear from you at your earliest convenience, and greatly oblige,

Very truly yours,
(Signed.) J. SCHALL WILHELM,
Secretary.

(Copy.)

North Carolina Agricultural Society,
Raleigh, N. C., April 20, 1894.

Mr. J. Schall Wilhelm, Secretary, Harrisburg, Pa.

Dear Sir: For the purpose of acquiring information which I think will be valuable to me, I write to ask that you will kindly answer the following questions relating to the work of your fair.

1st. Is your fair a stock company, or an organization directly or indirectly under control of the State?

2d. Have you any appropriation from any source, or any fund arising from any other source than that of gate receipts, privileges, etc.?

3d. What in your opinion, constitutes the best attraction at a fair?

4. What admission do you charge?

5th. What compensation is the secretary of your association allowed?

6th. What is your average daily attendance?

7th. Where, and at what time will you hold your fair this year?

I should be very glad to have you, if you can consistently do so. answer the above questions, assuring you that I am ready at any time to return or do so much if required of me.

In fact, I can state now that:

Our society is a stock company. It has an appropriation of $1,500 a year from the State. The secretary's salary is $1,200 per annum. The admission fee is 50 cents for adults; 25 cents for children. Our average daily attendance is—

Will you kindly mail me copy of your premium list for this year? I shall be very glad to send you copy of our list as soon as it is ready for distribution.

Please believe that I am not making inquiries from motives of idle curiosity, but with the view to acquiring facts upon which I may base some action for stimulating and encouraging the agricultural and industrial condition of this State.

Yours very truly,
(Signed.) H. W. AYER,
Secretary.

(Copy.)

Ohio State Board of Agriculture,
Columbus, April 25, 1894.

J. Schall Wilhelm, Secretary, Harrisburg, Pa.

My Dear Sir: Your favor of the 23d inst. has been received. In reply I have to say:

1st. I do not know of any new steps that have been taken by our State Board of Agriculture for the furthering of agricultural interests. We have all the work on foot that our appropriations from the State will carry through.

2d. Our new or special attraction at the State Fair will be a foot ball tournament in which the university teams of the State have been invited to take part.

3d. The State Fair will be held at Columbus, September 3-7. Our fair is permanently located at Columbus. We have permanent grounds, not excelled by any in the United States, on which we have expended about $280,000 in improvements.

4th. We charge an admission fee of 50 cents; for admittance to the grand stand, 25 cents and 50 cents for reserved seats. The grand stand will seat about 6,000 people, which gives us an additional revenue.

5th. I cannot tell you without calculation our average daily attendance, but it will run somewhere near 12,000. Thursday is always our great day; we sometimes have as high as 30,000 on that day.

6th. I send you under another cover copy of our premium list for 1894. I will be glad to see copy of yours as soon as it is out.

7th. I do not know as I have suggestions at this time to offer for the good of the "order."

I will be glad to hear from you at any time.

Very truly yours,
(Signed.) L. N. BONHAM,
Secretary.

(Copy.)

Virginia State Agricultural and Mechanical Society,
Richmond, Va., April 25, 1894.

J. Schall Wilhelm, Esq., Secretary P. S. A. Society, Harrisburg, Pa.

Dear Sir: Your esteemed favor of the 24th to hand and would say in reply that our premium list is now in the hands of printer and will be out in a week or so when I will send you a copy. This will I think give you all the information you are looking for. Our Exposition will last ten days this year, beginning October the 9th, and promises to be one of the very best the society has ever gotten up. We will be glad at all times to furnish you any information in our power.

Yours very truly,
(Signed.) WM. G. OWENS,
Secretary.

(Copy.)

Iowa State Agricultural Society,
Des Moines, Ia., April 26, 1894.

J. Schall Wilhelm, Esq., Secretary State Agricultural Society, Harrisburg, Pa.

Dear Sir: Yours of April 23d to John R. Shaffer received. At the January meeting in 1894, I was elected Secretary of the Iowa State Agricultural Society, to succeed Mr. Shaffer, and being a new hand in the business, cannot answer all of your questions, but will endeavor to answer some of them.

We have not fully decided on the list of attractions for '94, feeling that the fairs will have a hard time for a year or two, until the World's Fair has been forgotten to some extent. We are really at a loss to know what is best to do.

You will see by our letter heads that we hold our fair, beginning August 31st, to September 7th.

We charge 50 cents admission. As regards attendance, our best day has been about 60,000.

We send you to-day a premium list for this year. You will notice that we have taken in some new features that we think will be somewhat of an attraction, in the way of "Trap Shooting," "Bench Show," and we expect to add to those several other new attractions, and hope by that means to draw a good attendance.

If we can be of any service to you in this line, will be pleased to do so at any time.

Yours very truly,
(Signed.) P. L. FOWLER,
Secretary.

(Copy.)

Illinois State Board of Agriculture,
Springfield, Ill., April 26th, 1894.

Hon. J. Schall Wilhelm, Secretary State Agricultural Society, Harrisburg, Pa.

Dear Sir: Replying to your favor of the 23d inst. I have to congratulate you upon your re-election to the office which you hold in the Agricultural Society of the great State of Pennsylvania.

In regard to changes and improvements in the work of the Illinois State Board of Agriculture, I am glad to mention the fact that permanent fair grounds have been secured during the last year, near this city. Our fair will be held September 24-29 and a copy of the premium list will be sent you as soon as they are ready for distribution. Our general admission has always been 50 cents. Will write you in regard to attractions when they are determined upon.

Very truly yours,
(Signed.) W. C. GARRARD,
Secretary.

(Copy.)

State Bureau of Agriculture,
Baton Rouge, La., April 27, 1894.

Hon. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: Your favor of the 24th inst. is to hand this A. M., and in reply to same will say, that the Department of Agriculture of Louisiana make bi-ennial reports to the Legislature—the report for this year (1894) is now in the hands of the printer—will mail you a copy when completed. Your last annual address is received for which accept many thanks.

We have nothing new to report from the office—experiments, with new and improved varieties of seed, of every variety of plant, shrub, trees, etc., is conducted by the three experiment stations under the direct control of a director (Dr. W. C. Stubles), and bulletins of the successes and failures are published from time to time and distributed gratis.

In the matter of agricultural fairs we are very much behind the age and are hampered very much in this direction by the organic law of the State in prohibiting any appropriation whatever for that purpose.

The only fairs that are held are under private associations, but are evidences of the energy and enterprise of our people. They will be held this fall sometime (will have catalogues mailed when finished), at Shreveport, La., Jennins, Homer, Amiho City, Clinton, possibly Woodville and Bayou Sara. I will write the associations and have them mail you their publications.

I regret that I am not able to give you a more favorable report of our agricultural progress, but you of course understand that the bulletins and reports (which you received promptly I presume), are the public manifestations of our best efforts.

We hope to improve on our fairs the coming year.

Yours truly,
(Signed.) H. C. NEWSOM,
Commissioner.
Per N. S. Dougherty.

(Copy.)

Austin, Texas, April 27, 1894.

Hon. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: In reply to your letter of the 23d inst., I will say that I have no suggestions to make.

The following are some of the principal fairs held in the State, viz:

Texas State Fair and Dallas Exposition, Claude A. Cour, secretary, Dallas, Texas; Bell County Fair, Belton, Texas, Ed. T. Rucker, secretary; Fannin County Fair, Bonham, Texas, James Evans, secretary; Lampasas County Fair, Lampasas, Texas, John R. Shaffer, secretary; Bowie County Fair, Texarkana, Texas, ———— secretary; Concho Valley Fair, San Angelo, Texas, J. L. Phelan, secretary.

Respectfully,
(Signed.) JOHN E. HOLLINGSWORTH,
Commissioner.

(Copy.)

Pueblo, Colo., April 27, 1894.

J. Schall Wilhelm, Secretary State Agricultural Society, Harrisburg, Pa.

Dear Sir: Your letter of 23d to hand this A. M. The reports you sent me I received in good season, was very much pleased with them. Thanks.

The Colorado State Fair will hold no exhibition this year, owing to the dull times, so that I am not in a position to answer your questions.

Hope your exhibition this year will be more than you expect.

Yours truly,
(Signed.) JOHN K. SHIREMAN.

(Copy.)

University of Wyoming,
Laramie, Wyoming, April 30, 1894.

Hon. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Sir: I have forwarded you this day under separate cover, the last report of this University, in which you will find about everything mentioned in the way of agricultural work in this state for the past year.

We should be pleased to receive your annual report.

Would be glad at any time to give you special information on the subject under consideration if in our power.

Respectfully,
(Signed.) GRACE RAYMOND HEBARD,
Secretary.

(Copy.)

Massachusetts State Board of Agriculture,
Boston, Mass., May 2, 1894.

Hon. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: Replying to yours of April 24th, I have to say that the action of the Board at the Annual Meeting in organizing the Board into standing committees and the adoption of new rules and by-laws seems to me important as it will put the Board in shape to grapple with questions pertaining to agricultural matters in a more prompt and business like manner. The other matters that would be of interest to you will be found in the reports of our Cattle Commissioners, Gypsy Moth Committee and Dairy Bureau printed with my report. In another enclosure I send you a copy of the records of the last annual meeting of the Board, and also laws relating to the State Board of Agriculture and incorporated agricultural societies together with the rules and recommendations of the Board. I have received your last annual report for which please accept thanks.

Very truly yours,
(Signed.) WM. R. SESSIONS,
Secretary.

(Copy.)

The University of Wyoming,
Laramie, Wyoming, May 7, 1894.

Your bound reports for 1892 and 1893 are received. I appreciate your courtesy. If we can be of service to you in any particular at any time please command us.

Respectfully,
(Signed.) GRACE RAYMOND HEBARD,
Secretary.

(Copy.)

Delaware State Fair Association,
Dover, Del., May 16, 1894.

Hon. J. Schall Wilhelm:

My Dear Sir: Your letter of recent date at hand. Also received your annual report. I will try to give the answers to your questions as brief as possible.

1. We have taken no steps.
2. Our attraction this year will be Miss Myrtie Peak Combination.
3. At Dover, Del., Fairview Park.
4. Fifty cents for adults, and 25 cents for children.
5. About 5,000 daily.
6. Will gladly mail you catalogue.
7. Have no new suggestions to make at this time.

Yours respectfully,
(Signed.) JOHN B. WHARTON,
Secretary.

A BRIEF HISTORY OF DORSET HORN SHEEP.

By Jas. L. Henderson, Washington, Pa.

Somewhere away back in the centuries, it is claimed that the Dorset, and Merino, were of the same stock—the former was taken to the south of England, where under different conditions, and surroundings, a different type of sheep was developed, than that which remained in Spain, this origin, if true, explains the wonderful success of the cross with Dorset, and Merino in our day, I think among the best, if not the very best flock of grade sheep I ever saw, was the result of a Dorset ram, crossed on Black Top Merino ewes, the staple was an excellent quality of delaine wool, with considerable density, the carcas, a model of neatness, and compactness.

Professor Bell in his history of British Quadrepeds, in speaking of them says, "They are a handsome, though an old fashioned breed, principally esteemed for its producing lambs earlier than any other breed in this country. To the eye of him who seeks for beauty in harmony and proportion, this sheep is one of the handsomest in any part of England.

The strong formed body and limbs, the clear white fleece, the finely curved horns and other points will to him constitute a more pleasing combination of character than is to be found in those breeds which have become more changed from the old stock by repeated transmission of peculiarities, which however advantageous to the breeder, whether for sake of the fleece or flesh cannot be considered as adding to the abstract beauty of the animal.

All the writers on the subject agree, that they are a very old breed, but there is some difference, as to just how far back they can be traced as an established breed.

The county of Dorset, on the Southern coast of England, is the native home of the Dorset Horned sheep, but within the last fifty years, they have become very popular in other counties, notably, Somerset where it is claimed, the sheep are larger, with longer bodies, and legs, which is a questionable improvement, over shorter legs, and body with compactness, however, both types either combined, or bred along their respective lines, furnish good foundation stock for enterprising breeders to experiment upon.

Perhaps the most striking characteristics, and peculiarity of the breed is the fact that they are the only breed that can be depended on to breed at any season of the year, they will bear lambs twice in one year, but this practice is not recommended, three crops in two years is much better. This is a quality that can hardly be overestimated, as the owner of a flock of Dorset ewes can have his lambs dropped just at the time he wishes, at a time when he is not compelled to complete with a crowded market and low prices.

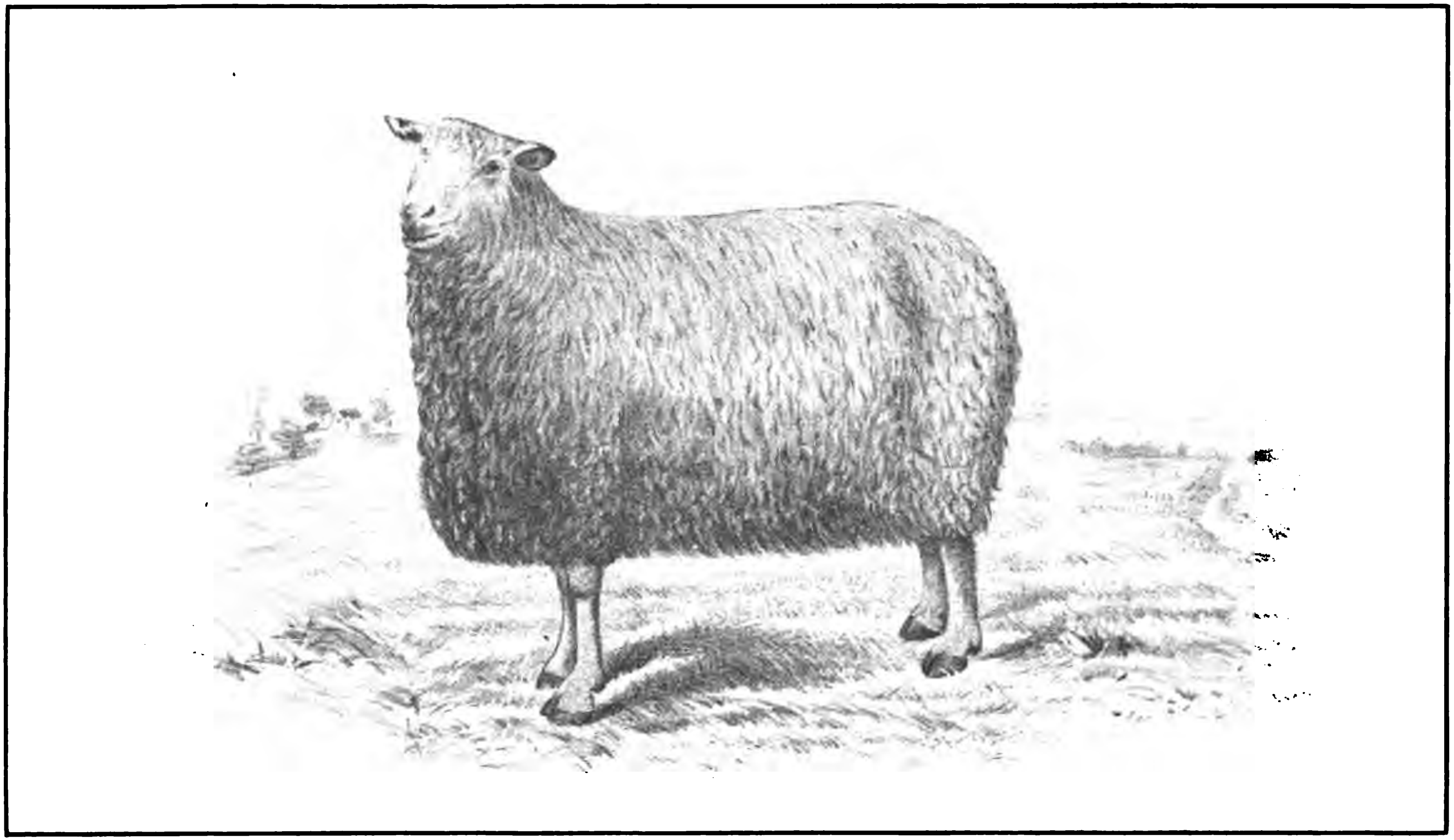
We have now, January 23d, lambs seven weeks old that weigh 60 pounds; one of our customers, Pennsylvania Reform School report a lamb that weighed 60 pounds at six weeks old, another a lamb that weighed 12 pounds at birth, and still another 13 pounds! these were all yearling ewes from our importation of 139 head in August; it is simply wonderful, how rapidly Dorset lambs grow, and fatten, not surprising however, when the remarkable udder developement of a Dorset ewe is observed, as a gentleman remarked recently, "they have udders like a Jersey heifer."

Another characteristic is, their fecundity, single lambs are unusual from aged ewes, generally twins, and often triplets, and a few cases of four, and five at one birth.

We had a ewe that dropped six lambs in fourteen months, viz: December, 1891, single lamb, July, 1892, twins, and February, 1893, triplets.

Accidentally, we had an imported Cotswold ewe served by an imported Dorset ram, the result was a lamb that weighed 111 pounds, when we sold it to the butcher, at less than 5 months old.

Our first importation was made in 1891, as an experiment, these gave such universal satisfaction to our customers, and ourselves that with Messrs. Buchanan and Craft, we again selected and imported 320 in June, 1893, and in August about 150 head. These were all personally selected from reputable breeders, and from recorded flocks, half of them or more have passed into the hands of customers in different states, and we have yet to know of a single one being killed with dogs; we are located near Washington with a population of about 12,000 with a number of hamlets near the suburbs, surrounded



CHAMPION I—122.—Winner of the Challenge Cup for Shearling Rams, at the Society's Show, held at Leyburn, October 1890 ; bred by Mr. J. O. Trotter, Holtby Grange, Bedale.

by dogs, and as Josh Billings says, "every poor man has two dogs, and he has known men to be poor enough to own five," but we have never had one killed, or worried, but we have frequently saw them chase dogs from the pastures. Just in our vicinity, 12 or 15 years, there were hundreds of sheep kept, but on account of the ravages of dogs, sheep husbandry was abandoned, so that whilst the writer would not claim that Dorsets were dog proof, yet the best evidence we have, seems to indicate, that they are better able to defend themselves against dogs than any other breed with which the writer is acquainted.

In conclusion, the following claims are well supported, viz:

1st. They are an old established breed, and hence capable of reproducing, and transmitting their good qualities to their offspring.

2d. They are noted for their fecundity, and prolificness.

3d. They are very hardy, and vigorous, fattening readily, at any age, and will thrive, and do well in large flocks, with ordinary care and feed.

4th. Whilst of a gentle domestic disposition, they are very pugnacious when attacked by dogs, and evince a disposition to defend themselves.

Finally, Dorset sheep possess so many good qualities, and so few bad ones, that any one contemplating the establishing a new flock, or improving what they have, will not be disappointed with Dorsets, is the candid opinion of the writer.

WENSLEYDALE LONG WOOL SHEEP.

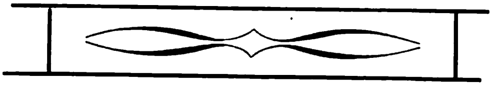
This valuable breed of British sheep takes its name from a valley in Northwest Yorkshire, but is extensively bred all over Yorkshire and adjoining counties. The characteristics of the breed may be summed up in the words quality and size; as to their mutton, it is of fine texture, with a large proportion of lean flesh.

The sheep grow to weigh 450 lbs. a head. Their wool is long, fine, lustrous and silky. The taste of mutton consumers of the present day runs on fine lean flesh, and if a sheep having this quality of mutton can be bred to a large size, it is evidently an advantage to the raiser to have a big sheep of good quality to sell.

Wensleydales in Great Britain are largely used for crossing purposes with the Black-faced and other breeds. In addition to giving mutton of the highest grade, they impart a wonderfully hardy constitution. Wensleydales clip on the average 10 lbs. of wool per head.

The Wensleydale Sheep Society, being anxious to bring their sheep under the notice of the American sheep breeders, have first sent to Baltimore, in charge of their Secretary, T. J. Other, a small consignment of sheep, thinking that ocular demonstration is a more satisfactory way of courting appreciation of their stock than any other method. Mr. Other is now in Baltimore and will be happy to show the sheep and give any information.

Address T. J. Other, 213 W. Fayette street.



OFFICIAL DOCUMENT, No. 7.

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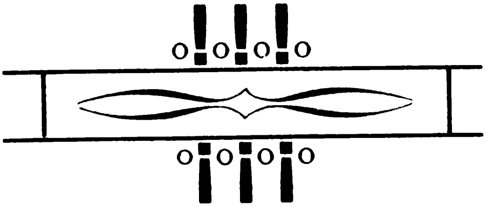

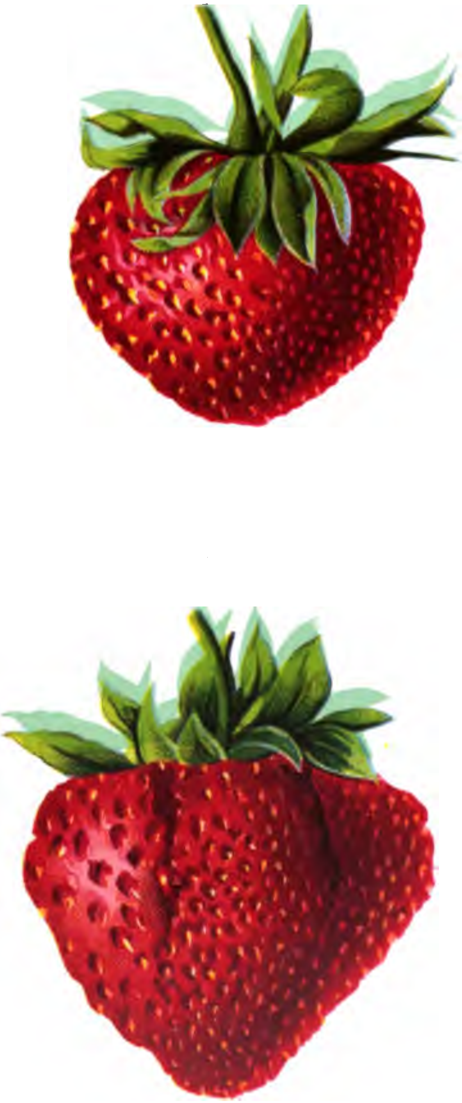

BRANDYWINE.

From I. F. Ingram, West Chester, Pa. W. H. Prestele, fecit.

OFFICIAL DOCUMENT, No. 7.

REPORT

OF THE

State Horticultural Association

BRANDYWINE.

A new Pennsylvania strawberry, of large size and good quality. Flesh red, firm and solid for so large a berry. Plants vigorous and healthy, continuing a long time in fruit. Folige very large, and as far as tested free from scald or blight.

The following history has been furnished by the originator, Mr. Ingram, West Chester, Pa.:

"I found three strawberry plants in bloom in a raspberry row, in spring of 1889. The plants were so strong with a good blossom that, although we found hundreds of seedlings, this one filled the first two important points in a successful variety, better than any I had seen. I watched the development of berries with a great deal of interest. Its lot was a hard one, right in a hill of Cuthbert raspberries that had occupied the ground for years without any manure.

"I succeeded in saving five berries from the birds, which were uniform in size and shape, firm, and pronounced the best in quality of that season. There was one point more, would it respond to generous treatment?

"I can say briefly, it has steadily gained each season without a failure, while others of the standard varieties have been discarded, until now I have no other fully tested variety in cultivation."

---

mittee to have the privilege of appointing two assistants.

Article 5. The society may, at any time, elect honorary members.

Article 6. The society may, from time to time, appoint professors on entomology, botany, horticultural chemistry and geology.

Article 7. This constitution may be altered or amended by a vote of two-thirds of the members present at any regular meeting, notice of the proposed amendment, in writing, having been previously given.

Article 8. Seven members shall constitute a quorum for the transaction of business.

1B-7-94

BY-LAWS.

Article 1. The committee on nomenclature shall collate and decide the standard and synonymous names of all fruits known in the society with the authorities for each, and report, so far as practicable, at each regular meeting, and record the same in a book kept for that purpose.

Article 2. The general fruit committee shall carefully and thoroughly investigate the subject of fruit culture in general. Each local committee of three shall collect such useful and interesting information in relation to the subject as may be in their power, and embody the same in monthly reports, to be made to the general chairman; such reports to be by him examined and embodied in his annual and semiannual reports. Also that the said county committee shall form ad interim committees for their respective counties, and further that said ad interim committees are hereby authorized to publish the reports in the "Gardener's Monthly," or such other paper, as they may select, the same having been first submitted to the chairman of the general fruit committee for his approval: Provided, That said publication shall be free of expense to the association.

Article 3. The annual meeting of the association shall be held on Tuesday before the third Wednesday of January of each year, at such a place as the executive committee may appoint, at which time the election for officers shall take place; said officers to serve from the close of the meeting at which they are elected to the close of the succeeding annual meeting, at which an exhibition and discussion of fruits shall take place and other business transacted in the following order:

1st. Reading of minutes of previous meeting.
2d. Roll call ad dues conllected.
3d. Election of officers.
4th. Reports of officers.
5th. Reports of standing committees.
6th. Reports of special committees.
7th. Unfinished business of former meeting.
8th. New business.

The nomination and election of new members shall be in order at any time during the session.

Article 4. Other meetings may be convened by the executive committee at such time and place as they may appoint.

Article 5. No member who is in arrears for dues shall be eligible for any office, or serve on any standing committee; and any member who shall neglect to pay his dues shall cease to enjoy the privileges of membership.

Article 6. A library shall be established for the benefit of the members of this association, and a librarian elected annually with other elective officers.

Section 1. The librarian shall keep in an alphabetical record of the books, etc., and may loan to any member of this association any books contained therein without cost: Provided, That it be returned within three months, and in as good condition as when received.

Section 2. Any member refusing to return to the librarian any books or reports from said library, shall pay their equivalent, or forfeit his membership.

LIST OF OFFICERS FOR 1894.

President.
W. H. MOON, Morrisville.

Vice Presidents.
H. M. ENGLE, Marietta.
HOWARD A. CHASE, Philadelphia.
J. E. JAMISON, Swales.

Recording Secretary.
E. B. ENGLE, Waynesboro.

Corresponding Secretary.
W. P. BRINTON, Christiana.

Treasurer.
J. HIBBERD BARTRAM, Milltown.

Librarian.
THOMAS J. EDGE, Harrisburg.

Professor of Botany.
THOMAS MEEHAN, Germantown.

Professor of Horticultural Chemistry.
S. B. HEIGES, York.

Professor of Ornithology.
Dr. B. H. WARREN, West Chester.

Chairman General Fruit Committee.
CYRUS T. FOX, Reading.

COMMITTEES FOR 1894.

GENERAL FRUIT COMMITTEE.

CYRUS T. FOX, *Chairman*, Reading, Berks county, Pa.

COUNTY.	MEMBERS.	P. O. ADDRESS.
Adams,	J. V. Garettson,	Flora Dale.
Allegheny,	E. P. Swift,	Mount Oliver.
Armstrong	J. Donaldson,	Kittanning.
Beaver,	A. L. McKibbin,	Green Garden.
Bedford,	S. S. Diehl,	Bedford.
Berks,	C. T. Fox,	Reading.
Blair,	F. Jaekel,	Hollidaysburg.
Bradford,	R. M. Welles,	Towanda.
Bucks,	Henry W. Comfort,	Falsington.
Butler,	W. H. H. Riddle,	Butler.
Cambria,	J. V. Mancher,	Carrollton.
Cameron,	F. G. Judd,	Emporium.
Carbon,	E. Bauer	East Mauch Chunk.
Centre,	Prof. George C. Butz,	State College.
Chester,	J. W. Pyle,	Willow Dale.
Clarion,	W. A. Henry,	Piollett.
Clearfield,	Samuel Hall,	McGee's Mills.
Clinton,	Joel A. Herr,	Cedar Springs.
Columbia,	E. M. Tewksbury,	Catawissa.
Crawford,	James Turner,	Meadville.
Cumberland,	H. S. Rupp,	Shiremanstown.
Dauphin,	Gabriel Hiester,	Harrisburg.
Delaware,	Samuel Larkin,	Booth's Corner.
Elk,	W. H. Johnson,	Benezett.
Erie,	G. A. Evans,	West Mill Creek.
Fayette,	George Hopwood,	Uniontown.
Forest,	C. A. Randall,	Tionesta.
Franklin,	C. W. Good,	Waynesboro.
Fulton,	B. C. Dawney,	Hustontown.
Greene,	L. W. Gwynn,	Carmichaels.
Huntingdon,	G. W. Owens,	Birmingham.
Indiana,	Noah Seanor,	Plumville.
Jefferson,	James McCracken,	Frostburg.
Juniata,	J. E. Jamison,	McAlisterville.
Lackawanna,	A. C. Sisson,	La Plume.
Lancaster,	Daniel D. Herr,	Lancaster.
Lawrence,	Samuel McCreary,	Neshannock Falls.
Lebanon,	Henry C. Snavely,	Lebanon.
Lehigh,	W. B. K. Johnson,	Allentown.
Luzerne,	P. Sutton,	Exeter.
Lycoming,	Peter Reeder,	Hughesville.
McKean,	Lucien Rogers,	Kane.
Mercer,	W. H. McKean,	Mercer.
Mifflin,	Henry Ort,	Lewistown.
Monroe,	R. F. Schwarz,	Analomink.
Montgomery,	H. W. Kratz,	Norristown.
Montour,	W. M. Gearhart,	Danville.
Northampton,	A. S. Shimer,	Redington.
Northumberland,	John Hoffa,	Milton.
Perry,	M. B. Eshelman,	Newport.
Philadelphia,	T. B. Meehan,	Germantown.

Pike,	Edgar Pinchot,	Milford.
Potter,	E. O. Austin,	Austin.
Schuykill,	W. H. Stout,	Pine Grove.
Snyder,	J. F. Boyer,	Mt. Pleasant Mills.
Somerset,	O. P. Shaver,	Friedens.
Sullivan,	E. A. Strong,	Dushore.
Susquehanna,	R. S. Searle,	Montrose.
Tioga,	S. M. Baker,	Brookfield.
Union,	Dr. George G. Groff,	Lewisburg.
Venango,	J. Miller,	Franklin.
Warren,	W. Cowan,	Warren.
Washington,	Pressly Leach,	Burgettstown.
Wayne,	Theodore Day,	Dyberry.
Westmoreland,	A. Ruth,	Scottdale.
Wyoming,	N. A. McKown,	Tunkhannock.
York,	Samuel Small, Jr.,	York.

COMMITTEES FOR 1894.

COMMITTEE ON NOMENCLATURE.

H. A. Chase, Chairman, Philadelphia.
Geo. D. Stitzel, Berks county.
Geo. A. Wagner, Perry county.
J. T. Smith, Juniata county.
Edwin W. Thomas, Montgomery co

COMMITTEE ON FLORICULTURE AND ABORICULTURE.

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P. C. Hiller, Lancaster county.
John C. Hepler, Berks county.
George Achelis, Chester county.
John C. Cullen, Northampton county.

COMMITTEE ON ENTOMOLOGY.

Herman Strecker, Berks county.
Ezra High, Chairman, Berks county.

COMMITTEE ON ARRANGEMENT AND RECEPTION.

George D. Stitzel, Chairman, Reading.
Cyrus T. Fox, Reading.
John C. Hepler, Reading.
Wellington Van Reed, Reading.
E. B. Engle, Waynesboro'.

LIFE MEMBERS.

Bartram, J. Hibberd, Milltown, Chester county.
Brinton, W. P., Christiana, Lancaster county.
Chase, H. A., 1430 S. Penn square, Philadelphia.
Cornelius, Robert, Philadelphia.
Engle, J. G., Marietta, Lancaster co.
Engle, H. M., Marietta, Lancaster co.
Engle, E. B., Waynesboro, Franklin county.
Ermentrout, Hon. James N., Berks co.
Fox, Cyrus T., Reading, Berks county.
Garretson, Joel V., Bigler, Adams co.
Hayes Charles P., 149 North Fifteenth street, Philadelphia.
Heyser, Jacob, Chambersburg, Franklin county.
Hildrup, W. T., Harrisburg, Dauphin county.
Hacker, William, Philadelphia.
Hoopes, Josiah, West Chester, Chester county.
Hiller, Casper, Conestoga, Lancaster county.
Hiller, Peter C. Conestoga, Lancaster county.
Landis, Israel, Lancaster, Lancaster county.
Martin, J. O., Mercersburg, Franklin county.
Pannebaker, William M., Lewistown, Mifflin county.
Reist, Peter S., Lititz, Lancaster co.
Scribner Prof. F. Lamson, Knoxville, Tenn.
Shaffner, Jacob, Harrisburg, Dauphin county.
Swift, E. P., Mount Oliver, Allegheny county.
Thomas, George B., West Chester, Chester county.
Thomas, Edwin W., King-of-Prussia, Montgomery county.
Van Deman, H E., Parksley, Va.

HONORARY MEMBERS.

Barry, P., Rochester, N. Y. (deceased).
Downing, Charles, Newberg, N. Y. (deceased).
Ellwanger, George, Rochester, N. Y.
Garber, J. B., Columbia, Lancaster co., Pa. (deceased).
Meehan, Thomas, Germantown, Pa.
Michener, Dr. E., Toughkenamon, Chester county, Pa. (deceased).
Parsons, S. B., Flushing, N. Y.
Parry, William, Parry, N. J. (deceased).
Rathvon, Prof. S. S., Lancaster (deceased).
Rowe, Hon. D. Watson, Chambersburg, Pa.
Rutter, John, West Chester, Pa. (deceased).
Saunders, William, Washington, D. C.
Stitzel, Hon. George D., Reading, Pa.
Thomas, John J., Union Springs, N. Y.
Warder, Dr. John A., North Bend, Ohio (deceased).
Willetts, Rev. Dr., Philadelphia.
Wilder, Hon. M. P., Boston, Mass. (deceased).
Wickersham, Dr. J. P., Lancaster, Pa. (deceased).

ANNUAL MEMBERS.

Ammarell, Charles, Reading.
Baer, J. C., Hamburg.
Barnhart, W. R., Greensburg.
Burkey, Joshua R., Reading.
Butz, Prof. George C., State College.
Benninger, W. M., Walnutport.
Bickle, Isaac, Reading.
Blankenbuler, J. R., Angelica.
Breneiser, Charles, Reading.
Bretz, William, West Fairview.
Bretz, W. C., Camp Hill.
Bracken, J. W., Hollidaysburg.
Briggs, W. H., Carrick.
Brinser, E. C., Middletown.
Brinton, John, Harrisburg.
Brinton, W. H., Atglen.
Brumbach, A. J., Reading.
Bucher, Riley, M. D., Lebanon.
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Cocklin, E. H., Bowmansdale.
Comfort, H. W., Fallsington.
Cooper, Calvin, Bird-in-Hand.
Davis, Edwin, Thompsontown.
Day, Theodore, Dyberry.
Derr, Cyrus G., Reading.
Donmoyer, M. T., Kutztown.
Eby, Simon P., Lancaster.
Edge, Thomas J., Harrisburg.
Endlich, G. A., Reading.
Engle, Ezra B., Marietta.
Eppihimer, Henry, Reading.
Eshelman, M. B., Newport.
Fahrenbeck, Geo. D., West Reading.
Fegely, Albert H., Reading.
Fetter, I. C., Reading.
Funk, B. F., Waynesboro.
Gross, Geo. W., York.
Gaul, James W., Vinemont.
Good, C. W., Waynesboro.
Griesemer, Charles A. Z., Reading.
Harnish, H. H., Chestnut Level.
Hartman, Fred'k S., Tuckerton.
Harper, William Warner, Chestnut Hill, Philadelphia.
Hartzler, J. K., McVeytown.
Hassler, E. O., Harrisburg.
Hawley, Jesse G., Reading.
Heiges, Prof. S. B., York.
Hendel, Henry B., Reading.
Hepler, John C., Reading.
Herr, Daniel D., Lancaster.
Herr, Aldus J., Lampeter.
Herr, D. H., Lancaster.
Hertzler, S. A., Strode's Mills.
Hertzler, John, Sr., Port Royal.
Hiester, Gabriel, Harrisburg.
High, Ezra, Reading.
Hoffa, John, Milton.
Hoy, Thomas, Orwigsburg.
Ingram, Edward T., West Chester.
Jamison, J. E., Swales.
Johnson, W. B. K., Allentown.
Kaufman, Cyrus W., Reading.
Keller, Col. D. C., Reading.
Kendig, M. D., Creswell.
Keppel, Samuel B., Sinking Spring.
Kershner, George W., Reading.
Kindt, S. S., Reading.
King, James P., 3316 Market st., Phila.
Kohler, H. W., Brillharts.
Kolp, Martin, Elizabethtown.
Kraemer, Louis, Reading.
Kready, John, Mount Joy.
Lauer, George F., Reading.
Lantz, J. C., Thompsontown.
Leinbach, Joseph A., Reading.
Leinbach, George A., Reading.
Linville, J. C., Gap.
Livingood, Frank S., Reading.
Longsdorf, C. L., Flora Dale.
Longsdorf, D. E., Mechanicsburg.
McGowan, James, Geiger's Mills.
March, Isaac F., Birdsboro.
Marks, Levi, Reading.
Meehan, Thomas B., Germantown.
Mengel, Levi W., Reading.
Meredith, S. M., Reading.
Merritt, Hon. Thomas P., Reading.

Mohn, John G., Reading.
Moon, W. H., Morrisville.
Moyer, John M., Beckersville.
Muhlenberg, H. A., Reading.
Nolan, William, Reading.
Northup, H. W., Glenburn.
Obold, John H., Reading.
Ort, Henry, Lewistown.
Page, B. W., East Salem.
Patterson, J. G., Stewartstown.
Pyle, J. W., Willow Dale.
Rakestraw, Thomas, Willow Dale.
Reber, Henry C. G., Reading.
Reeser, Jarius H., Athol.
Rife, Jacob L., West Fairview.
Ritter, Milford N., Reading.
Roop, Dr. J. Warren, Harrisburg.
Rupp, H. S., Shiremanstown.
Rupp, John F., Shiremanstown.
Rush, J. G., West Willow.
Sallade, Wm. H., Topton.
Scherer, R. W., Manatawney.
Schoenly, W. H. B., Reading.
Schweyer, D. H., Bower's Station.
Schock, Oliver D., Hamburg.
Schaeffer, Rev. N. C., Lancaster.
Scheidy, Daniel, Pine Grove.
Scholl, Calvin P., Fisherville.
Scholl, Dr. Wm. H., Reading.
Shanahan, Hon. W. F., Reading.
Spanogle, H. A., Lewistown.
Shimer, A. S., Redington.
Shoemaker, R. C., Jarrettown.
Seidel, Franklin, Maiden Creek.
Smeych, Daniel, Lancaster.
Smith, J. T., Swales.
Smith, F. Leaf, Reading.
Snavely, H. C., Lebanon.
Spanogle, Andrew, Lewistown.
Stahle, Col. J. A., York.
Stambaugh, H. A., Mifflintown.
Stetson, P. R., Reading.
Stitzel, Henry N., Lorah.
Stitzel, William, Lorah.
Stout, W. H., Pinegrove.
Stoneroad, V. D., Lewistown.
Stauffer, A. K., Reading.
Stubblebine, John G., Morgantown.
Swigart, S. J., Lewistown.
Thomas, Joseph W., King-of-Prussia.
Tyson, H. S., York.
Van Reed, Wellington, Reading.
Wagner, George A., Alinda.
Weidner, Aaron R., Arendtville.
Weiss, C. S., Allentown.
Wentzel, Aug. L., Reading.
White, Rev. J. W., Milroy.
Whitner, George K., Reading.
Williamson, Edward, Morrisville.
Woods, T. A., Harrisburg.
Wynnings, Roy, Lebanon.
Yeager, A. H., Greenland.
Young, Andrew M., Womelsdorf.
Young, J. Gerhart, Reading.
Zerr, E. M., Geiger's Mills.
Zigler, Amos, Rowenna.

STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

Thirty-fifth Annual Meeting.

Notwithstanding the fact that all preliminary arrangements had been made to hold this meeting at Reading, Pa., it was deemed advisable, and for the best interests of the association to meet elsewhere. The circumstances which led to this change of programme are fully set forth and explained in the following notice, which was published in the programme and announcement of our annual meeting:

"In consequence of the State Board of Health having issued a proclamation setting forth that a large number of cases of small-pox existed in the city of Reading, and that new cases were occurring daily, many of our members expressed a desire that our meeting this winter should be held elsewhere. A number even stated that under the circumstances they would not attend the meeting if it was held in Reading. Judge Stitzel and Mr. Fox, representing Berks county on our committee of arrangements, were consulted in regard to the matter. Although they were of the opinion that the meeting could be safely held in Reading, as the disease was abating and had been greatly exaggerated, there having been no cases at any time in the business section; yet they fully realized the injury that had been done by the proclamation, and that the meeting in their city might be slimly attended, and, therefore, waived their claim for 1894. Harrisburg having been recommended as a suitable place for our coming meeting, the suggestion was approved by our executive committee."

In accordance with this arrangement the association held its meeting on Tuesday and Wednesday, January 16 and 17, 1894, in the supreme court room. There was a good attendance and the proceedings were interesting throughout. The absence of Prof. M. B. Waite, of the Department of Agriculture, Washington, D. C., who was announced for an address on "Fungus Diseases of the Pear and Apple," was a great disappointment to all. The letters of Secretary Morton in reference to the matter will be found in the report of our proceedings.

Among the pleasant features of the meeting was the presence as a visitor and delegate of L. B. Pierce, of Tallmadge, Ohio, a prominent member of the Ohio State Horticultural Society, a leading horticulturist and a well-known contributor to our agricultural and horticultural periodicals. He was cordially welcomed and invited to take part in our deliberations.

During the meeting the following new members were enrolled for 1894.

Ammarell, Chas. Reading.
Bracken, J. W., Hollidaysburg.
Brinton, W. H., Atglen.
Brinton, John, Harrisburg.
Derr, Cyrus G., Reading.
Funk, B. F., Waynesboro.
Good, C. W., Waynesboro.
Hassler, E. O., Harrisburg.
Johnson, W. B. K., Allentown.
Linville, J. C., Gap.
Longsdorf, D. E., Mechanicsburg.
Roop, D. J. Warren, Harrisburg.
Rupp, John F., Shiremanstown.
Scherer, R. W., Manatawney.
Schoenly, W. [illegible] B., Reading.
Scholl, Calvin [illegible]., Fisherville.
Shanahan, Hon. W. F., Reading.
Stitzel, Henry N., Lorah.
Stitzel, Wm., Lorah.
Stubblebine, Jno. G., Morgantown.
Weidner, Aaron R., Arendtville.
Weiss, C. S., Allentown.

President Moon called the members to order at 2 p. m., and the secretary read minutes of last annual meeting, which were approved as read.

Judge Stitzel suggested that the roll of members be called, and that those present respond to their names. Before a motion to that effect was put, the secretary stated that while he had with him a list of members, it did not include those who had joined the association during the past year, and was, therefore, incomplete. Calling the roll was therefore indefinitely postponed.

Mr. L. B. Pierce, a delegate from the Ohio State Horticultural Society, and Messrs. J. C. Linville, Wash. L. Hershey and M. D. Kendig, delegates from the Lancaster County Agricultural and Horticultural Society, submitted their credentials, which were duly accepted, and the aforenamed were accorded the privileges of the floor. The secretary also read a letter from Prof. Meehan regretting his inability to be present.

The president appointed a committee of five, consisting of Judge Stitzel, H. S. Rupp, H. C. Snavely, E. W. Thomas and W. B. K. Johnson, to nominate officers for the coming year.

The following

REPORT OF GENERAL FRUIT COMMITTEE

was read by Chairman Cyrus T. Fox, of Reading, Pa.:

To the officers and members of the State Horticultural Association of Pennsylvania:

Gentlemen: Your chairman of the General Fruit Committee would report having received more general responses to his inquries as to the fruit crop of 1893 than in any previous season. During the past six weeks letters were received almost daily, and nearly every county in the State was heard from. Even Forest, the smallest county, which is almost exclusively a lumbering district, sent its answers, so that the report which has been compiled from this correspondence will be found to cover every fruit-growing district. As to the fruit results of the past year, your chairman would, therefore, report as follows:

Apples.

The apple crop was an inferior one, except in some sections of southeastern Pennsylvania, in central Pennsylvania and in the northern tier of counties. In most counties of the State it was only one-fourth to one-third of an average crop, and the quality of the fruit was poor. The prospects were good in the spring for a full crop, but the drought which prevailed in July and August caused the fruit to drop prematurely. What did not drop was blown down by three great storms during the summer. A terrific hail storm on the 5th of July also did serious damage to the crop in some parts of southeastern Pennsylvania, not only stripping trees of their fruit but cutting the limbs and injuring the bark. The trees grew very well, however, and formed new wood, so that with favorable conditions a good crop of apples may be expected this year. Insects were very destructive in 1893, and it was impossiple to raise perfect fruit without spraying trees. In some cases a single spraying was sufficient. Owing to the failure of the apple crop in other States, prices for good fruit have ruled high this winter. Many reports were received to the effect that the fruit is not keeping well.

Among the sections of the State which were favored with comparatively good crops may be mentioned: Bucks and Chester counties, in the southeast; Bradford, Tioga and McKean, in the north, and Blair, Centre and Clinton, in the central portion. In Bucks county there was quite a good crop of apples of fair quality, but their keeping qualities were not as good as in some other years. In Chester there was a good yield throughout the county, but the crop was much injured by storms before the picking season commenced. What was saved sells at high prices. Our treasurer, J. Hibberd Bartram, of Chester, reported that he had an abundance of apples, many of his trees breaking down with their weight of fruit. The apples were more perfect and highly colored than ever before, especially the Smith's Cider. He gave his trees but one spraying. In Centre county the apple crop was very large and the quality fair. Many carloads were gathered up and shipped west. The farmers received 35 cents per bushel for hand-picked apples, delivered at the railroad. A good many apples were also shipped from the western section of Bradford and the adjoining county of Tioga.

Pears.

Pears did rather better than apples, but the late varieties were badly damaged by storms, and many trees were stripped of their fruit, except the Keiffer, which appeared to be storm-proof. The reports in regard to this variety were very favorable, showing it to be the most profitable variety that can be grown for the market. It is exceedingly productive, and its high color causes it to sell very readily. In the estimation of Dr. Groff, of Lewisburg, one of the Union county correspondents of the General Fruit Committee, it is "the ideal family pear," one of the best for cooking purposes in the whole list. Unfortunately, it is not up to the Bartlett or Seckel for flavor. The Bartlett did fairly well in some sections of the State, but the fruit was small. The midsummer drought was the cause of some varieties being below the average size. The unusually heavy yield of 1892 caused a light yield of pears in some sections of the State last year. Early varieties of pears proved first-class where the trees were sprayed, but the fruit of unsprayed trees was mostly wormy, with some scab. There was less blight than in any previous year, which led some fruit growers to hope that the disease has run its course and entirely disappeared. The only counties to report any blight were Northampton and Monroe in the northeastern section, York in the southern and Northumberland in the central section of the State. In the last mentioned county a number of trees were killed by blight.

Peaches.

There was an abundant yield of peaches in those sections of the State where peaches are grown to any extent and are given proper cultivation, but prices were low. In most of these localities also the quality of the fruit was inferior, owing to the drought. The districts in Pennsylvania in which the peach receives the greatest attention at the present day are the Juniata Valley and southern Franklin county. In the former the crop was designated a fair one, but the quality was the best in many years. Prices, however, were low. In Franklin county there was an immense crop of rather fine fruit, and the quality was good, but the cash returns to the growers were unusually small. Many peaches were shipped that did not pay expenses. Dr. J. B. Amberson, of Waynesboro, in that county, reported the largest crop ever grown, and the quality above the average. In Beaver county the trees were overloaded, yet the fruit was excellent. In Blair county many peach trees were killed by dry weather. Some Chester county reports were to the effect that there was much premature fruit. "Weather dry and crop immense, peaches small and prices low," wrote one correspondent. In Cumberland the peaches were very fine. There was a full crop, and all trees ripened their fruit well. Good prices prevailed. In Dauphin county the prices were about one-half those of the previous year. Lackawanna county reported: "There has been the largest and finest crop of peaches in our county this season that has been grown for years. Many of the trees broke down under their great burden of delicious fruit." Ex-President Snavely, of Lebanon, reported that his trees were overloaded. The fruit was small, owing to drought, and ripened very unevenly, in the fore part of the season especially. In Lehigh the yield was large; the fruit was strictly first-class, large and clean, and brought remunerative prices. Similar reports were received from sections of Montgomery, Northampton, Snyder, Somerset, Union, Washington, Westmoreland and York counties. Some of these counties, however, reported that while the yield was immense, the fruit was inferior in size and quality, except where the trees had been judiciously thinned out and cultivated thoroughly.

Plums.

Owing to the many difficulties attending the growing of plums, not much attention is paid to this crop in Pennsylvania. The curculio, black knot and other drawbacks have discouraged fruit growers, so that plums are not grown to any extent for market. However, some feel encouraged to plant, as by careful cultivation and the spraying of the trees at the proper time, good crops can be realized in favorable seasons. One correspondent wrote that he will plant one hundred plum trees in the spring. In most sections of the State the plum crop, during the past season, was a failure. In some counties, however, very fair crops were realized, and in several districts the yield was large. The earlier sorts did best, but the fruit was small. The drought of midsummer affected the general crop disastrously. The fruit dropped from the trees prematurely. Bradford county reported "an unusually good crop." Other counties which reported good crops were Bucks (certain localities), Clarion, Columbia, Dauphin (eastern section), Huntingdon, Lancaster, Lawrence, Lebanon, Lehigh, Montour, Northumberland, Susquehanna, Warren and Westmoreland. In all other sections of the State there was less than one-third of a crop except certain varieties, which did fairly well. The general failure is not attributed to the work of the curculio, as the ravages of this insect, save in a few counties, were not as extensive as usual. The Lombard, Richland, Damson and Green Gage are the varieties in regard to which the most favorable reports were received. On the experimental grounds at the Pennsylvania State College, in Centre county, there was a full crop of the following varieties: Yellow Gage, Coe's, Lombard, German Prune, Duane's Purple, Bradshaw and Orange. All other varieties gave but meagre returns. J. W. Pyle, of Chester county, reports the Asiatic varieties as doing well wherever tried. Gabriel Hiester, of Dauphin, says that the "black knot" has killed all the trees in his section, and he knows of no profitable orchard. A. C. Sisson, of Lackawanna, recommends careful thinning to prevent rot. Daniel D. Herr, of Lancaster, recommends the Japan varieties, and says that there is no more trouble to raise plums than any other fruit, if the Japan varieties are planted, or the trees are sprayed. H. C. Snavely, of Lebanon, says his crop was fine and perfect. He has Imperial Gage, Lombard, Prince Engelbert, German Prune, Gen. Hand and several other varieties. W. B. K. Johnson, of Lehigh, reported the yield of plums better than for a number of years, and stated that "there seems to be a change in this fruit for the better; the 'knot' seems to be less prevalent than in former years." W. H. Stout, of Schuylkill, reported that the curculio destroyed nearly all plums during the dry season. Dr. George G. Groff, of Bucknell University, Lewisburg, Union county, reported that the Spaulding, German Prune, Richland and Lombard on his grounds were full, but rotted badly. Theodore Day, of Wayne county, says that plum trees in his section of the State often die before bearing. They will bear one full crop, and the next season only flowers, or perhaps a few sample fruits, after which the trees will be found to be slowly dying.

Quinces.

The quince is still a neglected fruit in Pennsylvania, although it is receiving more attention every year. It is a profitable fruit and always commands a good price in the city markets. One correspondent alleges that not much attention is given to quinces, because few appear to know how to grow and when to pluck them. Others say that the trees suffer greatly from blight, but that they have found spraying to bring success. The borer is one of the worst enemies with which growers are compelled to contend. There were good crops of quinces in most sections of the State in 1893, but prices were moderate. Low prices, however, have not prevented increased plantings of quince trees, and some correspondents write that much interest has been aroused in this fruit, resulting in the planting of many trees. One correspondent, James Donaldson, of Armstrong county, reports that a good many quince trees were planted during the past few years in his section of the State, and that success is attending the cultivation of the fruit, although some damage has been caused by blight. Gabriel Hiester, of Dauphin, writes that owing to the ravages of the coddling moth most of the quince trees were dug out before anything was known about the efficiency of spraying with Paris green. J. E. Jamison, of Juniata, had a good crop of fair fruit, the result of spraying his trees. He says that there is no fruit so much benefited by spraying as the quince. A. C. Sisson, of Lackawanna, has found that a strong solution of whale oil soap, applied two or three times during the season, is a sure exterminator of the borer. W. B. K. Johnson, of Lehigh, reported that the quince trees in that county bore well, but the quality of the fruit was poor to medium, owing to the "help yourself treatment" that the trees get. Inferior fruit sold as low as 40 to 50 cents per bushel, but fruit from trees carefully cultivated brought from 80 cents to $1.00 per basket. Some choice quinces commanded $1.25 to $1.50 per basket. Prof. S. B. Heiges, of York, reported an excellent crop of finely grown quinces, which he stated was something unusual. Among those who obtained excellent results from spraying their quince trees, resulting in fine crops of fruit after years of failure, were B. B. McClure, of Northampton, and A. F. Dickey, of Somerset. Dr. George G. Groff, of Lewisburg, had excellent success with his quinces, which has encouraged him to plant more trees. He will set out 150 trees of the Orange variety in the spring, thus making a total of 175 quince trees in his plantation. Unlike the apple and pear, the quince has no off year. It is a great bearer, and, therefore, very remunerative. Prices were lower, however, in the season of 1893 than in any previous year for a long period. Quince trees become very old and are said to bear longer than apple trees. The very best trees grow on strong clay loams, but they also thrive well on damp, gravelly drifts. On sand or gravel the bushes never stock up as thickly as they do on clay or loam. This was the experience of Peter Reeder, of Lycoming, who reported as follows: "Where the trees were grown on a heavy soil the yield and quality was good; on dry, gravelly ground the crop was very short."

Cherries.

Most counties in the State reported an excellent crop of cherries. Some correspondents stated that they never knew a more abundant yield. However, there were some localities in the State where the crop was meagre. In those sections the sweet varieties were almost a failure, but the sour kind did better. Our treasurer, J. Hibberd Bartram, of Chester county, reported the best crop of sweet cherrries he ever had; at least he sold more. The weather having been dry they did not rot so badly. H. W. Northup, of Lackawanna county, near Scranton, wrote: "The market was full of cherries. There is the greatest demand in our market for the sour varieties." Casper Hiller, of Lancaster county, says the crop was better than for years. There was very little rot, and the foliage was healthy all summer. In his opinion, the leaf rust that has been prevalent for years, causing unhealthy wood, is the primary cause of rot.

As to varieties, the Early Richmond, Governor Wood, Montmorency, Napoleon Bigarreau, May Duke, Yellow Spanish and Black Tartarian continue to be the leading varieties. E. P. Swift, of Allegheny, says that his most reliable sort is the red Montmorency. Other correspondents speak highly of the same variety. H. W. Comfort, of Bucks county, regards the Early Richmond as the most profitable cherry. The Montmorency is given the credit of being larger and better than the Early Richmond, although a little later than the latter variety. R. M. Welles, of Bradford county, reported that the "cherry aphis" was very destructive on the coarse, rank-growing varieties of cherries. He added: "I lost a very fine young Windsor, just coming to bearing, by trying too strong a spraying combination to destroy the aphis. It did the whole thing dead. The finer varieties rot badly."

Grapes.

The season was favorable for the grape crop. Owing to the dry weather of July and August there was very little rot. In some sections the fruit was late in ripening. The substance of the majority of the reports received from all the counties in the State may be stated in a few words. The crop was large and the quality excellent, but prices were low and unremunerative. The crop was, in fact, too abundant to be profitable.

Spraying or bagging was essential to ensure success. M. T. Dommoyer, one of Berks county's most successful grape growers, has found that he cannot raise grapes successfully without resorting to spraying or bagging. Many other growers in the State give this as their same experience. Treasurer Bartram, for instance, did not get his grapes bagged nor sprayed. The vines bore well, but the grapes amounted to nothing as far as marketing was concerned. Gabriel Hiester, of Dauphin county, wrote that "grapes that were sprayed ripened their crop perfectly, and there was less than the usual trouble on unsprayed vines, owing to the dry, hot summer." C. A. Randall, of Forest county, reported that the rose bug, and a long yellow bug were very destructive among the vines in his section of the State. Growers used air-slacked lime upon their vines with good effect. In some sections of the State the grape crop was injured by severe hail storms early in July. Dr. Groff, of Lewisburg, had his fruit injured somewhat by downy mildew and anthracnose. Insects were also bad.

As to varieties, the Concord continues to be the most popular grape in Pennsylvania, and in some localities it is grown to the exclusion of all other kinds. A number of the newer varieties have, however, become very popular and are proving profitable to raise. Among these may be particularly mentioned the Niagara, Moore's Early, Moore's Diamond, Salem Worden, Woodruff Red and Wyoming Red. The Niagara has been found to succeed in almost any locality providing it is bagged. It seems to require this treatment more than any other grape. In regard to the Woodruff Red, Secretary Engle reported: "One of the most promising new varieties fruited this year was Woodruff Red. Although not first-class in quality, it is a beautiful grape, keeps well and holds its foliage to the last." Casper Hiller, of Lancaster county, marks Woodruff Red quite high, and says that the Eaton and Woodruff Red are both very showy and fairly good, and consequently they bring the highest prices. Dr. Groff, of Lewisburg, says his Moore's Early and Niagara grapes were "as fine as fine could be." He intends planting 100 Moore's Early in the spring. Prof. Hieges, of York, has forty-six varieties of grapes fruiting, and mentions in particular Woodruff Red, Wyoming Red and Moore's Diamond as having been very superior.

R. M. Welles, of Towanda, gives his experience in regard to varieties during the season of 1893, as follows: "Woodruff Red is a poor bearer. Empire State, Moore's Early, Niagara, Worden, Delaware, Brighton and Concord are all good croppers. The Lady and Jessica do well, but are not reliable. Jefferson is a good grape and cropper but too late."

E. C. Brinser, of Dauphin county, relates his experience as follows: "Concord, Worden, Moore's Early, Cottage, Eaton, Jewell and Niagara were fine. Daisy is early. Telegraph and Champion are no good. Empire State is not satisfactory. Pocklington and Brighton are poor."

W. B. K. Johnson, of Lehigh, who has a number of new varieties in cultivation, says: "Wyoming Red is the best red. Eaton is improving. Woodruff Red is good. Moyer, doubtful." As to other new varieties he prefers to report after another year's trial.

Small Fruits.

Small fruits, especially raspberries and blackberries, suffered from the protracted drought. Strawberries fared better. Currants and gooseberries yielded well. This about explains the season's results in the State. Prices for all berries were good, with no glut in the market at any time. The growers of small fruits in the vicinity of Scranton report that they had enormous crops of strawberries, raspberries and blackberries. A great many berries are grown for that market. Strawberries are a specialty. In Monroe county there was a full crop of strawberries and raspberries. Straberries yielded well in Northampton county. Correspondent B. B. McClure, of that county, says: "Strawberries ought to be cultivated more extensively; the supply never exceeds the demand. The same may be said of currants." In Berks county there was a prolific crop of strawberries and good prices were realized. Raspberries promised well, but dry weather cut the season short. Blackberries dried on the stalks and the crop was a poor one. Currants and gooseberries were more plentiful than for some years. In Dauphin county, Correspondent Gabriel Hiester says, "raspberries and blackberries have been allowed to run out, as the growers of Dauphin county cannot compete with those of York county, where the hills appear to be especially adapted to these fruits."

As to varieties in Pennsylvania, there is a wide difference of opinion, some kinds doing well in certain sections of the State and poorly in other localities. The Sharpless continues to be a standard strawberry, and is probably grown more extensively than any other variety. R. M. Welles, of Bradford county, in his report says: "A fair crop of strawberries. Very moderate yield of red raspberries. Black caps do very poorly, being destroyed by anthracnose. As to the gooseberries, Downing and Industry did well. There was a good crop of currants, Fay's Prolific being the favorite. In mulberries, Downing's Everbearing winter kills and is not worth growing. The Russian varieties are hardy and good yielders."

E. C. Brinser, of Dauphin county, in reporting on small fruits, says: "Strawberries good crop. Raspberries suffered much from the cold winter and drought. With blackberries it was the same and the crop was short. Currants fair. I am slow to recommend any, but think Greenville strawberry a good new one. Cromwell, a new cap raspberry, very early and good. Erie blackberry, not so new, but very good."

Secretary Engle wrote: "Am much pleased with Bubach, Haverland and Eureka strawberries; while of raspberries, Gregg, Shaffer's Colossal and Marlboro are most satisfactory."

D. M. Seyler, of Berks county, who grows strawberries largely for the Reading markets, considers the Sharpless and Michel's Early the leading varieties. He had a large crop of each last year.

S. M. McMaster, of Indiana county, says: "I recommend the Bubach strawberry, Muskingum raspberry, Kittatinny blackberry, Fay's Prolific currant and Industry gooseberry."

J. E. Jamison, of Juniata county, has found that with him the Sharpless strawberry and Gregg, Souhegan and Ohio raspberries are the best.

A. C. Sisson, of Lackawanna, says: "Can recommend Warfield, Parker Earle, Bubach No. 5, Lovett's Early, Eureka and Haverland in strawberries; Cuthbert still holds first place in red, and Hilton, Johnson's Sweet and Gregg in black raspberries."

P. Sutton, of Luzerne county, writes: "Of the newer varieties of raspberries that I have grown the Muskingum is a good yielder and is firmer than the Shaffer, yet the latter still holds its own as being the largest yielder of the two. The Palmer does well here, but is not as large as the Gregg. Ada and Nemaha fail to come up to representations made by the introducers. Thompson's Prolific fails to perfect its berries. Not one berry in fifty fills out fully. Taking it all in all, I think that the raspberries that will surpass the Ohio, Gregg, Tyler, Souhegan, Mammoth Cluster, Shaffer, Cuthbert and Golden Queen are still to be introduced. The best blackberries with me are Kittatinny, Taylor, Stone's Hardy, Minnewaski and Snyder. The Erie has done very poorly with me so far. Berry very small and no better flavor than any of the above. Most of our soil here is infested with white grubs to such an extent that strawberry growing is a precarious business.

John Hoffa, of Northumberland county, a member of the State Board of Agriculture, regards the Lucretia dewberry as a great acquisition, and worthy of extensive cultivation.

W. H. Stout, of Schuylkill county, has found the Gregg, Early Ohio and Cuthbert raspberries to be the best in his locality.

Dr. Groff, of Lewisburg, reports the Palmer and Golden Queen raspberries as very fine.

Prof. Heiges, of York, says: "Erie blackberry, and Ohio and Lovett's black cap raspberries were very fine with me this year, and I can recommend them highly."

O. P. Shaver, of Somerset county, one of the most experienced growers of small fruits in southwestern Pennsylvania, writes as follows: "In red raspberries I have Cuthbert, Shaffer and Turner. Cuthbert and Shaffer are good. Turner, berries too small and a light crop. In black cap raspberries I have Souhegan, Gregg, Hilborn and Ohio. Souhegan, too many berries, therefore under size. Hilborn, nearly equal to Gregg in size and yield. Ohio, no good. In blackberries the Snyder is my favorite for a cold climate. As to strawberries, I have fruited the past season the following varieties: Staminates—Cumberland, Sharpless, Jessie, Parker Earle, Saunders, Governor Hoard, Oliver and Oregon Everbearing. Pistillates—Crescent, Haverland, Bubach, Barton's Eclipse and Martha. Soil, heavy clay. Staminates: Sharpless is too shy a bearer. Oliver a very large berry, but also too shy. Parker Earle, a tart, firm berry; good for canning, but bears too heavily; therefore cannot mature all the fruit. Governor Hoard is a very fine berry, but the crop was light last season. Saunders did well in yield and size. The previous season it was very irregular in form. Last season it was very nice and plump. Jessie leading, and Cumberland next. In quality, the latter leads; but in yield, Jessie is ahead. Pistillates: Haverland is my leading variety for yield and quality, with Crescent second. I am testing a few new varieties, and next season will tell the story. The Oregon Everbearing is a humbug. I will say, in short, I have no new varieties to tie to. A year ago I was very much impressed with the success of Governor Hoard, and now have to back down. My next season planting will be: Jessie, Cumberland, Haverland and Crescent. For a crop I will plant very sparingly of new varieties, but will continue testing each new variety for three successive seasons. Last season I had 93 bushels from a little over three-fourths of an acre. Drouth reduced the yield some."

Vegetables.

July and August were very unfavorable for vegetables. In some sections of the State scarcely any rain fell during those months. Consequently all late vegetables suffered, except the late crop of cabbage and celery, which were benefited by the rains of September and October. Late sown turnips also yielded a fair crop. Up to the first of July the season was good, and early vegetables did well. There was a large yield of onions in almost all sections of the State. Peas and beans had a short season owing to the drought. The tomato crop was seriously affected and sweet corn was imperfect. The early crop of potatoes was fair and good prices were realized. Late potatoes were not much more than half a crop, although there were some exceptions. The general crop, however, was probably the smallest reported in a number of years. There were some favored localities where local showers at a critical time in the growth of the crop resulted in a production equal to or above that of the average year.

More attention is being paid to this department of the horticultural kingdom, and the markets of our cities are being well supplied with vegetables raised by farmers and gardeners residing in contiguous territory. It is a lamentable fact, however, tnat many farmers' gardens contain only a few kinds of vegetables. One-half of the garden is usually devoted to early potatoes, and the remainder to lettuce, onions and cabbage, the onion bed giving place later to celery. Peas, beans and tomatoes are only produced in limited quantities. Farmers who turn their attention to raising vegetable crops for market, rarely go beyond potatoes, onions and cabbage. Where there are canning establishments, an impetus is given to the production of sugar-corn, peas, Lima beans and tomatoes. Market gardeners in the vicinity of Scranton had good crops of potatoes, and the prices were the best they ever realized. Showers occurred at the proper times during midsummer to save the general crop. There were other localities in northern and western Pennsylvania where potatoes yielded largely, owing to more favorable conditions, than those which prevailed in the eastern and southern sections of the State.

As to new varieties of vegetables and remarks in regard to the season of 1893, the following information has been gleaned from the reports of correspondents, and is given in brief: E. P. Swift, of Allegheny, had a fine crop of horticultural beans from an acre or two early in the season. R. M. Welles, of Bradford, reports the Giant Paschall celery to be a splendid variety. Howard G. McGowan, of southern Berks, who usually raises from 1,000 to 1,200 bushels of potatoes for the Reading market, had only half a crop, having obtained a yield of 500 of 600 bushels. His potatoes, however, were very fine, and he was awarded first premium at the Berks county fair. His largest crop was 1,253 bushels, when he had a return of over 200 bushels to the acre. He plants ten inches apart in the rows, the distance between the rows being from two feet nine inches to three feet. H. W. Northup, of Lackawanna, writes: "Our potatoes are the finest we have grown for years. The season was rather dry, but we had frequent showers and our vegetables were fine all the way through the list." E. O. Austin, of Potter county, says that the potato growers of that section shared in the good luck attending the showers that visited the northern counties. "Potatoes were the best and finest for years," he writes, and all root crops were so. All vegetable gardens were prime this season. It was favorable generally. The drouth effected some plants to their great injury, but most were excellent. R. S. Searle, of Susquehanna, another northern tier county, reports large yields of all kinds of vegetables, especially root crops. He had 200 bushels of carrots from 30 square rods of ground, and about the same yield of sugar beets. The farmers of the southern townships of Chester county went largely into the raising of potatoes. From the vicinity of Oxford, which is only a few miles from the Maryland line, 60,000 bushels of potatoes were shipped to market, which netted the growers 60 cents per bushel.

Shrubbery, Plants and Flowers.

It is gratifying to learn that there is continued progress in the beautifying of the door-yard and surroundings of home with shrubbery, plants and flowers. Shade trees are being planted by the roadside, and deciduous shrubbery and flowering plants in front of and around the house, so that passing through almost any rural district in Pennsylvania the stranger's attention is attracted, and the thought suggests itself that here are homes within which intelligence and culture may be found. Flowers are becoming more and more indispensible in all the tender offices of friendship, hospitality and home life. They grace the table of rich and poor, doing even more than the spotless linen or shining ware to make the meal something more than the mere satisfying of the appetite. The cultivation of flowers in a commercial way is becoming more general, and is proving a profitable occupation, as at all seasons of the year, there is a demand for them, and at certain times they can scarcely be supplied in sufficient quantities. In the late fall almost everybody in the cities may be seen wearing a chrysanthemum, and these showy flowers have become so popular that they may be found on sale in all railroad stations and at hundreds of other places in the leading cities of the country.

As showing the interest that is being taken in the outward adornment of home, the following extracts from the correspondence of your committee will suffice: "Rural ornamentation is still progressing. Our young people are taking great pride in this branch," writes one correspondent. "Continued progress must be reported to the credit of the county. Chrysanthemums more popular than ever; also roses Hydrangeas quite popular," writes another. Other correspondents say: "More flowers are adorning the farmers' yards now than ever." "Much progress is made in outdoor adornment." "There is a continued improvement yearly manifested in the adorning of grounds around homes. A little local interest has been shown in putting out Holland and other bulbs for spring flowering." "The custom of home improvement is quite general in this section." "More attention paid yearly. Much more might be done to advantage." Considerable progress made all through the county." "Shrubbery and hardy roses are planted in nearly all the house-yards in this section," (Cumberland county). "I think there is a steady though gradual improvement in this direction. The farmers are using the lawn mower more each year, and their door-yards present a more tidy and well kept appearance." "Our people are realizing the importance of the outward adornment of homes more every year. Shrubbery, rose bushes and decorative and flowering plants are being set out, thereby making home more attractive," this from little Forest. "The taste for ornamental trees and plants is growing steadily. In flowers, chrysanthemums are the rage, and are more largely planted every year. "Increased attention in towns; not much in country," is what a central Pennsylvania representative says: "People are making fair progress yearly in this department." is a statement from western Pennsylvania. "There is quite a growing disposition to plant more evergreens, shrubbery and the different varities of maples, and anything that will make the home more pleasant and happy," is a voice from the Juniata Valley. "Our yards are adorned with these ornaments, but our wives and daughters have charge of the beautiful and we are not so well acquainted with them," writes a northern Pennsylvania correspondent. "A steady increase is noticeable from year to year," writes another correspondent in the same county. "There is a marked increase in the attention given to ornamental gardening," comes from the Lebanon Valley. A nurseryman in the Lehigh Valley writes: "I have handled more in this line this year than in any previous year. Judging by that indication I would say we are progressing, with very fair promises for spring. Tastes are improving for better and more expensive plants." "The business is growing, and some of our green houses are doing a fair business," writes a Wyoming Valley man. "Our people are giving plants and flowers more attention than formerly. Many have finely ornamented lawns and door yards. A great demand is prevailing for bulbs." The foregoing comes from the west branch of the Susquehanna. "Constant progress is being made in the adornment of grounds," is a statement for northeastern Pennsylvania. "More interest shown yearly in plant-growing," comes from the lower Schuylkill Valley. "Every year seems to improve a little upon the past," writes a central Pennsylvanian, and another from an adjoining county, says: "Much has been done in the adornment of home and grounds." A correspondent in northern Pennsylvania writes: "Our town is new, only seven years old, so not much is done yet for adornment, but I noticed that many yards and lawns were nicely fixed up last spring and suitably adorned. The progress in this is fair—as good as one could expect from our laboring people." An anthracite coal region correspondent says: "Some effort is made by nearly every family to have a few flowers of ordinary varieties, mostly annuals." Another county in the northeast reports: "Our people take considerable interest in shrubbery, plants and flowers, especially our best farmers; it is catching." "Much is being done in the way of the outward adornment of homes," is a voice from southern Pennsylvania.

These reports from all sections of the State show renewed interest in the subject. It is astonishing what an influence a good example will exert. One individual of taste in a community will prove a great benefit to the entire neighborhood. One correspondent, writing from the lakes and mountains of Wayne county, says: "I planted under many difficulties several hundred early blooming bulbs lately, hoping to have a fine show of flowers next spring and awaken my neighbors' ideas a little." The beautiful campus of the Pennsylvania State College in Centre county has had a powerful effect in central Pennsylvania in cultivating a love for the beautiful. Writes one of the college professors: "Scarcely is a new house started now without some spirit of ornamentation with plants being apparent, largely because of the influence of the college campus." The observance of arbor day has had an excellent effect upon the pupils of the public schools of the Commonwealth in developing an interest in the planting of trees and shrubbery.

As to horticultural novelties which came into prominence last year, the following are deemed worthy of a place in this report: The Japanese Anemones have excited much admiration, as also a number of new varieties of evergreens, and the Variegated hop vine. The Gladiolus Childsii has been thoroughly tested and found to be a marked improvement over the old varities. The flowers are much larger than those generally grown. The "tree rose" has been sold in Allegheny county for two or three years, and none have been known to die thus far. It is believed to be perfectly hardy, having withstood the severe winter of one year ago. The Japanese pink, new in the vicinity of Pottstown, is described as a very desirable plant by a correspondent of that vicinity. The marked improvement in Chrysanthemums has caused them to become great favorites, and all the newer and more gorgeous varities are being extensively cultivated.

The Peach Yellows' Law.

The query in the General Fruit Committee's circular: "Has anything been done in your locality in regard to enforcing the 'Peach Yellows' law?" elicited the information that very little has been done in that direction; and yet the presence of the law on the statute books of the State has had an excellent effect, as it has resulted in the eradication, voluntarily by their owners, of peach trees affected by the yellows, without a resort to the enforcement of the law being necessary. A grower need but call his neighbor's attention to the existence of the law, in order to secure the removal of an infected tree. During the past year there was considerable inquiry for copies of the law, and your Chairman having obtained a supply was glad to furnish them to all applicants. The people are being educated to the fact that the disease known as "the yellows," is incurable, and that the only way to deal with trees showing the first unhealthy indications is to dig them up and burn them. The origin and nature of the "yellows" is still a subject of dispute, but the pathological knowledge imparted by Dr. Smith, of the Department of Agriculture, at the last meeting of our Association, as the result of his long-continued and paintaking experiments, was proof positive that it was an atmospheric disease, communicable by inoculation, and that the eradication and destruction of an infected tree is the only safeguard to prevent the ruin of all peach orchards or trees in the neighborhood in which the disease has appeared. A pamphlet containing Dr. Smith's views and explanations with plates of diseased trees, should be circulated in every peach growing district.

E. P. Swift, of Allegheny county, referring to the "Peach Yellow" law of Pennsylvania, says: "I tried to enforce the law, but our township supervisor always ran off when I confronted him with it; and our justice of the peace found no provision for costs in the act of Assembly. My neighbors, some of them, have trees affected with the disease on their lots. I cut down and burned nearly all of my early varieties." In regard to the provision for costs, our correspondent is mistaken. The act of Assembly contains a penalty, and the imposition of the penalty carries with it the costs. The Pennsylvania law is similar in many of its provisions to the laws which are in force in Delaware, Michigan and California, and contains features of the law of each of those States.

R. M. Welles, of Towanda, remarks: "The writer cannot say that he ever saw a case of 'Peach Yellows.' Rotting of peaches upon the trees and their rusting, has been common for years, as has also the 'leaf curl,' though this latter has not been as bad for two years or so as several years ago."

An effort is being made to prevent the sale in the cities of peaches plucked from trees affected with Yellows. California has a law covering this point, and Delaware is about taking similar action. Early last summer the matter was brought to the attention of the Philadelphia Board of Health by a committee of Delaware peach growers, owning 275,000 bearing trees. The chairman, John J. Rosa, addressed the Board. He appealed to that body to prohibit the sale of premature or diseased fruit.

"What we desire," said he, "is to secure your co-operation in preventing the sale of these diseased peaches, because they are a menace to the health of the people who eat them. In every orchard there are hundreds of these diseased trees, the fruit of which ripens much earlier than the healthy peach. These premature peaches are bright in color, inviting in appearance, of large size, but very insipid. Their effect upon those who take them into their system is similar to a laxative. There is not a fruit grower in the State of Delaware who would dare to assume the risk of eating two of these peaches in succession; yet the growers will gather and ship them here and to other cities, simply because they secured good prices for their wares."

The Subject of Spraying.

The twelfth inquiry in your committee's circular was as follows: "What attention is being paid to spraying fruit trees in your neighborhood?" To this the answers were that spraying is being tried everywhere, and great interest has been aroused on the subject. Many fruit growers have become convinced of the fact that it is impossible to raise perfect crops without spraying. This has been shown in the reports made in regard to apples, pears, peaches, plums, quinces and grapes. The discovery of the various formulas for fungicides and insecticides has been worth millions of dollars to the fruit growers of the United States. The formulas originally used have undergone some changes, as it has been found that weaker solutions than those first promulgated were just as efficacious, while the cost of preparing them was greatly decreased. The formulas as given to this association and many farmers' institutes by Prof. S. B. Heiges, of York, recently appointed Pomologist of the Department of Agriculture at Washington, D. C., may be found at the end of the proceedings of the State Horticultural Association, as published in the annual volume of "Agriculture of Pennsylvania" for 1892. They should appear in every State agricultural report for the next half dozen years, until every person owning a fruit tree has become thoroughly familiar with them, and accustomed to their use. The diluted Bordeaux mixture seems to be more effectual than the other preparations for application to almost all fruit trees, as well as to potato vines to kill the bugs and overcome the blight. It is less easily washed off by rain, but the foliage and fruit are given a sort of white-washed appearance, owing to the lime which it contains. The copper carbonate solution is not open to this objection. However, the Bordeaux mixture is applied when the fruit is in such an embryo condition that the matter of stains is not of sufficient importance to receive consideration.

It is surprising that spraying, since its good effects have become known, is not more general. It has been given wide publicity by the agricultural and horticultural journals of the country, and the method of making and applying the Bordeaux mixture has been published over and over again. Fruit growers, who make it a business to supply the markets, take hold, because it is a matter of dollars and cents to them. Farmers allow their orchards to go unsprayed, because of other pressing work, and the little labor that the use of the spraying apparatus involves. A few may object to the expense, but no outlay of money will prove more remunerative. There is an opening in every agricultural district for some enterprising person to go around with a wagon and pump, to spray the trees in farmers' orchards and gardens. Fruit is offered in the markets of our cities and towns that is hardly fit to use, all for the want of spraying. It is encouraging to report that in some counties spraying has made great progress. In Bucks county, last season, about one-half the acreage was sprayed, or three times as much as in the previous year.

Gabriel Hiester, of Dauphin, says: "A few, myself among the number, have been spraying for several years, and find that we derive great benefit therefrom, both in the quantity and quality of our fruit and the thrift of our orchards." C. A. Randall, of Forest county, says: "I think in the near future all will adopt the method, as they are now realizing the importance of spraying."

J. E. Jamison, of Juniata county, writes: "My success in spraying far exceeded my most sanguine expectations. I sprayed my plums, pears, quinces, grapes, currants and some apples, in the fruit line, and then I gave my chicken house a good soaking, which worked like a charm. As the result, I had the finest and most perfect fruit, and many of my trees I had to pick off some of the fruit before ripening, to save the trees from breaking down. My chickens were not troubled with vermin the whole season. Still another observation. I had very little black rot on my plum trees, and no blight on my pear trees, and I had the finest currants in the country, all of which I attribute to spraying."

H. W. Northup, of Lackawanna, writes: "The most progresive in our locality are spraying their vines and trees."

Casper Hiller, of Lancaster, says: "That spraying is beneficial is established. We still lack the right kind of sprayer for the person who has only a few dozen trees and vines. The force pump is too cumbersome, and the knapsack not effectual on trees. Both are expensive." As to the grape rot he writes: "Spraying will prevent it, but with me it will not prevent the depredations of birds, bees, wasps, etc. If I want grapes I must bag. On a plot of 50 vines I left every seventh vine unbagged and got no fruit on that vine. The spraying up to the time of ripening kept the fruit very nice, but when fully ripe not a single bunch was fit for market. The storms played havoc among the grape bags."

B. B. McClure, of Northampton, writes: "The sprayer was used last season by many people of our county for the first time and with good results in all cases that came under my notice. There was such a poor stand of fruit in the spring that sprayers had little encouragement to work for results, but the influence was very marked in my own orchard."

R. S. Searle, of Susquehanna, member of the State Board of Agriculture for that county, says: "I am sorry very little attention has been given the matter of spraying in this section. I made this a prominent subject at three Farmers' Institutes, and the people are getting aroused to its necessity."

Prof. Heiges, of York, says: Spraying is coming into use slowly, as our men become convinced of its usefulness. I know of no one who has discontinued it after giving it a fair trial.

The spraying of fruit trees is carefully practiced at the Agricultural Experiment Station at the Pennsylvania State College, and at all similar stations in the United States. A correspondent writing from the New Hampshire station says: "The Flemish Beauty pear trees, which were sprayed under the direction of the Experiment Station produced fine specimens of perfect fruit, while those on neighboring trees not sprayed were cracked and worthless. Potatoes which were sprayed to prevent blight, showed a very marked improvement in the product, the tubers being much larger and smoother than those not sprayed."

General Observations.

It may be said, in a general way, that the experience of the past season was disappointing to most horticulturists and fruit growers. Good crops of fruit were expected, as the trees, especially peaches, had come successfully through the very severe weather of the previous winter, when the mercury went down to 20 degrees below zero. The Delaware peach growers gave up the fight on the 16th of January—just one year ago to-day—when the temperature was 4 degrees below zero and still dropping, and yet their trees were uninjured, and they had one of the largest crops in the history of the State. Predictions are now being made that owing to the mild weather of this winter, and the lack of a covering of snow, fruit trees will expand their buds prematurely and there will be no fruit. A correspondent of the Philadelphia Evening Telegraph, at West Chester, reported under date of Jan. 9 (one week ago) as follows:

A fruit-grower of this place to-day said that two-thirds of the fruit trees in Chester county will not bear fruit next summer. The warm weather of last week served to bring on the trees to such an extent that many of them were beginning to bud, and several instances were heard of where peach trees were out in blossom. There were at least three trees in West Chester out in bloom on Saturday, but the weather of yesterday served to freeze them. The trees that were well advanced towards budding now give signs of being badly injured, and the fruit-grower prophesies a very small crop of early fruits next season.

Low prices were another cause of disappointment. This was especially the case in the peach-growing districts of the State. The crops were large and quality good, but in many instances they were handled at a loss. This was partly due to the great crops in Delaware, Maryland and New Jersey, and an occasional glut in the market. The financial stringency and depression in business also exerted an unfavorable influence. As for grapes, the bottom appeared to have dropped out of the business. The prices were the lowest that the market has ever reached. Four and one-half pound baskets sold at 10 and 12½ cents each, and after deducting the expenses of packing, transportation and commissions the grower had less than 1½ cents per pound for his fruit. It is claimed that grapes of good quality, packed in baskets, that sell in the cities for less than two cents per pound return no profit, and are sold at an actual loss to the producer. Your Chairman bought nine pound baskets of the finest Concords and Catawbas in Chicago in October for 15 cents. When he returned to Reading he found the same kind of baskets selling for 20 cents. This was also the price in Philadelphia. E. P. Swift writes in regard to the Pittsburgh market: "The best Concords sold slowly at three cents per pound in our markets at retail. Later, nine or ten-pound baskets sold slowly at 15 cents; the basket costing 2½ cents. A man from Canton, O., brought a carload to our city. He sold it but had not a cent left when his expenses were paid. He will ship no more."

Even the peach growers of Delaware found it necessary to come together at the close of the season and discuss prices. On November 23d a number of them assembled at Milford to discuss the crops of 1893, and the profits thereof. They gave their experience to the effect that the crop brought them 21 cents a basket. The expenses of packing, cultivation and hauling were to come out of these figures. Better prices were realized in Pennsylvania. Some growers in Chester and Lancaster counties, near the Maryland line, averaged 50 to 60 cents per basket in the orchard. D. M. Seyler, of Berks, who supplies dealers in Reading, and also has several market stalls, where he sells fruit at retail, had a fine crop of Globe peaches. The Globe, which originated in Berks county, is one of our largest varieties, and the fruit is highly colored. The tree is not as sure a bearer as either of the Crawfords, but the fruit commands the highest prices. Mr. Seyler carefully assorted his peaches, and for the best he obtained $1.75 per basket. He was much pleased with Chairs' Choice, a variety that he obtained by accident, and which fruited with him for the first time. In a lot of trees which he ordered there were fifty of this variety, although he had not selected them. The fruit is of the highest flavor and very saleable. He readily realized $1.25 per basket for them.

E. P. Swift, of Allegheny, makes the following observations: "As to apples I thought I observed an aphis on the smaller branches of the trees early in the spring, but may have been mistaken. There was a promising bloom and enough fruit set, but it fell off, or rotted or became knotty and worthless. It seemed to be an off year with the pear trees, yet I had fruit of the following sorts: Dearborn's Seedling (full crop), Doyenne d'Ete, Washington and little Madeleine. I like Reeder, Margaret, Superfine and Manning's Elizabeth. For near market, I have not found a better raspberry than the old Philadelphia. It requires no staking, is marvelously prolific, and, when freshly picked, of fairly good quality."

James Donaldson, of Armstrong, attributes the wormy condition of the apple crop to the fact that the crop was light and there was less fruit to work on. Had there been a larger crop more fruit would have escaped the worms. Speaking of pears, he says the Keifer bore heavily, and adhered well to the limbs so that the storms did not shake them off. He ripened the pears to perfection by keeping them in a dark, cool place. This variety was less wormy than most other kinds.

A. L. McKibbin, of Beaver, considers the Champion the leading quince. Keifer was the only pear that did well in that county. Small fruits did well, especially strawberries, but prices fell below the average.

James Van Buskirk, of Berks, has had great success with Moore's Diamond grape, and also the Early Moyer, but says the Worden and Niagara are still the leading varieties in his neighborhood. The Jessie strawberry he prefers for delicacy of flavor. The Bubach is a fine shipper and the Sharpless is the largest berry. More progress in fruit-growing has been made in his township in the past 5 years than in the 20 years prior thereto. Mr. Van Buskirk is one of the vice presidents of the Berks County Agricultural Society.

Oliver D. Schock, of Berks, writes: "One of the peculiarities of the average farmer is his disregard of the attention that is due the orchard. One of the most general complaints of the farmer is a lack of apples, and in several cases that have recently come under the writer's observation, it was clearly shown that the failure of the apple crop in the orchards referred to was caused by the lack of fertility. No other crop could have survived a season on the soil, without the application of manure or fertilizers in some form, yet the owner could not comprehend why his neighbor should have realized such a large crop, while his own trees, of the same age and varieties, fail to produce, year after year. The apple tree requires plant food, and if the trees are not properly fed, we need not expect that they will feed us—at least not for any long term of years." Mr. Shock had great success in bagging Niagara grapes. "Saw none better at any fair this season. Bunches large, compact and fruit better in flavor than in former years."

R. M. Welles, of Bradford county, has appended some strawberry notes to his report. In speaking of late spring frosts killing blossoms and young fruit, he says: "Though it is a well-known fact that strawberries not mulched are less liable to be injured by late May or early June frosts than those that are mulched, yet I have not seen in print any allusion to the fact that if the day previous to a frost be cloudy and cold, so that the sun has no opportunity to warm the ground, all strawberries, whether mulched or not, suffer alike from frost. If a freeze occurs, even covering the plants with straw does not save fruit as a rule from freezing."

Mr. Welles also writes as follows in regard to diseased (or blighted) strawberry plants: "For six or eight years past, in my home garden culture upon four successive patches, the plants have been increasingly injured and destroyed without my being able as yet to discover the cause. Usually the plants showed a short or stunted growth and small dried-up fruit. Often in fully grown stalks and leaf, the latter have shown uneven and sickly coloring, and many plants have died. I have frequently examined affected plants for crown-borers and never discovered the work of but one in a single plant. Neither have I been able to find any aphidae about the crowns or any other insects. In making new plantings I have made them upon fresh ground, but used mainly plants of my own growing, though adding some new varieties. The latter soon showed—particularly in the second year and after—the same difficulty. Is there a fungous disease affecting strawberry plants? In all of my reading about strawberry troubles I have seen nothing that appears to show any such trouble as has occurred in my experience. I have not in my garden burned over the ground after fruiting each year, as I have done in field culture when growing for market. Is the described trouble caused by insects?" Mr. Welles also says: "The Parker Earle strawberry in my experience was very disappointing. It set a great deal of fruit, but matured but little and that of very ordinary quality."

J. V. Mancher, of Cambria, writes: "The season was exceedingly dry during the months of June, July and August, and as a consequence vegetation suffered severely. Tomatoes suffered most, the crop being an entire failure, (owing to rot). Apples and pears were small in size and much infected. Fruits of all kinds were small and of poor quality, excepting quinces."

Edwin Bauer, of Carbon, says: "Judging from the exhibits at our fair, we are second to no county in fruit-growing, taking into consideration the fact that we have a small and principally mining county."

Prof. George C. Butz, of the Pennsylvania State College, Centre county, writes: "Just recently an agent from York county appeared in Centre county, to organize an Osage Orange Hedge Company, and had great hopes of being successful. He offers to plant for $1.00 per rod and care for the hedge by replanting and pruning for three years. I personally believe that farmers will make a mistake if they think these fences are less troublesome than ordinary wooden fences. A very conclusive experiment upon the profitableness of spraying Bordeaux Mixture on grapes troubled with mildew was conducted under my direction. The method was that usually recommended in bulletins. Many fine old specimens of trees suffered greatly by the unusual storms from August to October. Old vines of the Japan ivy (Ampelopsis Veitchii) were torn from stone walls, where they have resisted the ordinary storms of many years. A tree of the curly willow (Salix Babylonica annularis) attracted attention on the college campus because considerable new growth showed a reversion to the original type with straight, slender leaves."

Henry S. Rupp, of Cumberland county, observes: "Taking all fruits together, last season was about an average one, both for yield and prices. The only short crops were sweet cherries and winter apples. No new insects or diseases in any of the fruits. There was nothing done to enforce the peach yellows law. Although nearly all peach growers know about it, and cut the trees away when they see they are affected by yellows. There are no large orchards in this immediate neighborhood."

Gabriel Hiester, of Dauphin, writes: "The only observation I have to make is this. I think by spraying my orchards and vineyards I add at the very least $1,000 to the receipts of my farm—45 acres of which are planted in fruit, and only about 20 acres of this in apples, pears and grapes, which are the only crops I spray, so that I would value my spraying at $50 per acre. This is not mere guess work, but a careful estimate after three years' observation of its effects."

E. C. Brinser, of Dauphin county, writes: "I am convinced more and more that high tilth, high feeding and strict attention given to fruit growing is highly necessary. We need to study the wants of plants (and consumers as well) to succeed. It seems to me I learn more by my errors than by my success. Every season, as it comes and goes, leaves lasting impressions, and perhaps my errors would fill the largest volume. I am, however, pleased to learn that I can grow as fine fruit (of such varieties as I have grown) as any that I have seen in this part of the State, or with very few exceptions at least. The season was one of extremes; very cold in winter that many raspberries and blackberries suffered much, followed by great drouth when the fruit ripened. Some disease (probably anthracnose) attacks our Gregg raspberries, so that a bed over 2 years old is not worth much. Cromwell, Ohio and Hilborn seem not to suffer in this way. The worst enemy in insects that I can't fight or combat is the grub worm in the strawberry plot. When I discover his presence the mischief is done. I also observe that there is more feeling or inclination among the people to engage in fruit growing, and it seems the more fruit grown, the more the people want."

C. A. Randall of Forest county, says: "Our plums are usually injured by a small fly, which causes the plum to drop off after being stung. Were it not for that we could depend upon a good crop of plums every year. One farmer had his crop entirely destroyed by this fly and the curculio. We are not advised as to what relation the latter has to the former, if any. His neighbors on adjoining farms had a good crop by the use of air-slacked lime sprinkled over the trees. The same experience was had by the same parties with the grape crop. We have advised the spraying of trees next season, and think it will be extensively engaged in this county."

Secretary E. B. Engle, of Franklin county, writes: "A canning establishment began operations here this season, and had a capacity of about 1,000 bushels per day, but oftentimes could not take all the fruit that was offered. Taking the season through, I am informed that those who were stockholders in the canning factory, and whose fruit took precedence there, realized better average prices than those who shipped their fruit. On the whole the season has been discouraging to peach growers, and planting will be checked for a time."

"I want to add a kind word," continues Secretary Engle, "for the Ben Davis apple, which as a regular and prolific bearer, a good keeper, and a general purpose apple for family use in this section should stand near the head of the list. I consider it a surer and a heavier bearer than the York Imperial; more showy and handsomer in appearance; as good, if not better for cooking; and about as good a keeper. I think it one of the most promising winter apples for this section."

C. W. Good, of Franklin, says: "Owing to the money returns to the producers of horticultural products, which are below the remunerative point, often below the cost of handling, a general lethargy prevails. It is very unfortunate that while the fruit growers' products sell so low, there are millions of people all over our broad land, who cannot have even a limited supply. In the future it will not be much of a matter in our Cumberland valley to grow fruit, and fine fruit, in appearance as well as in quality. Our soil so varied in the different localities, and our beneficial climate, betoken a future for the fruit-growing in the Cumberland Valley that may surprise other localities. But the growing of fruit and the marketing of it are quite different matters. For the present our attention should rather be directed towards getting paid for the fruits that our present growing trees and vines may produce rather than to the increasing of the number of trees and the size of our orchards. I doubt if there is another location in the United States where so many varieties of grapes can be grown to such perfection as in the vicinity of Waynesboro."

Dr. J. B. Amberson, of Franklin county, writes: "I fruited the Elberta peach for the first time this season. In color and appearance it is No. 1; size medium, but uniform; quality superior probably to any other; flesh firm."

Hon. George W. Owens, of Huntingdon county, observes: "Other opinions to the contrary notwithstanding, I am convinced that Peach Yellows is caused by an insect working at the root of the tree, which saps its vitality and produces the condition of decay called 'Yellows.'

As a preventative, make the soil very rich in potash by the use of Kainite, wood ashes, coal ashes, etc. Place a pinch of ashes around the collar of the little tree as soon as the seedling appears above the ground, increasing the quantity up to the last of June. Each season do the same from April 1 to the last of June in increased quantities; also place coal ashes in abundance around the trunk. In order to make the coal ashes go farther, I take powder cans which are thrown out at the stone quarries; take out the ends and place around the tree and fill with coal ashes."

Hon. Noah Seanor, of Indiana county, writes: "The Yellows in some sections have entirely destroyed the peach trees. When I found that my peach trees were affected I destroyed them and planted others which are growing finely, and thus far have given no indications of the Yellows. The rose bugs were very plenty during the past season, and in some localities they almost destroyed the rose bushes and the grape crop. Worn out rubber shoes when burned to create a smoke to drive them away or destroy them, appeared where tried to be as successful a method as any for getting rid of them. The potato beetles were not so numerous this year, and gave the farmers in this vicinity very little trouble, excepting the old-fashioned black ones, or gray ones in some sections, were very numerous and did a good deal of damage."

J. E. Jamison, of Juniata county, writes: "The year 1893 now past has been one full of disappointment. An average crop of fruit that brought in very little in return for our labor. Our berries and all of our early vegetables, fruits, etc., brought fair returns. Peaches and pears sold very low, in many instances not bringing more than the freight charges; while plums, owing to a short crop, sold as high as $2 and $3 per bushel, and ready sale at that. But owing to the stagnation in all our public works and manufacturing establishments, from an unsettled condition of our government, tens of thousands of laboring men were out of employment, and consequently had no money to buy fruit. One estimate for Altoona alone says had times been good, and men been working full time, 10,000 baskets more peaches would have found ready sale at fair prices. Another thing that my observations call to mind. The peach growers of Juniata and adjoining counties, to be successful, must raise larger fruit, be more particular in packing, and not ship so many culls. Put up more evaporators and evaporate the small fruit, as there is a fair market for evaporated fruit.

A. C. Sisson, of Lackawanna, says: "We have a new seedling gooseberry from Catawissa, Pa., that out-ranks all other sorts thus far in yield, quality and mildew-proof. It is not yet named."

Casper Hiller, of Lancaster county, in speaking of pear blight as having apparently died out, continues: "Did you ever hear the idea advanced that blight runs in cycles? The late Jacob B. Garber believed so and said that in 1822 the pear was terribly affected and up to about 1880 he had noticed three or four periods of blight and no blight. In the early 80's my orchard was badly affected. Some of the trees were entirely destroyed and others partially. Some of them made new sprouts from the ground; others have half-dead trunks. There has been no blight in them for three or four years, and they bear very good fruit."

Henry C. Snavely, of Lebanon, ex-president of our association, writes: "A drought prevailed during the ripening of the strawberries which cut this crop short and affected the black caps, but I never had a finer crop of Cuthberts than in 1893. Of the thirty varieties of grapes in my vineyard all did well with few exceptions. Some of the Rogers' hybrids were perfection; so were the Catawbas. Some varieties of grapes, notably the Rogers' hybrids, do not seem to make full clusters if planted by themselves, but when close to other varieties, as the Concord, Moore's, Cottage and some others, it aids in pollenizing and full, large clusters are the result. The Brighton may also be classed with the Roger's in this respect. It also seems to me that spraying during bloom, especially if dry, helps pollenization. There was very little black rot or mildew. This was largely due to the dry weather. The earlier peaches were caught in the drought and remained small. The storm in the latter part of August was quite damaging to fruit and trees. The apples also suffered largely. The plums were fine, and a full crop, except a few varieties. Quinces were abundant and fairly good; apples a short crop of inferior fruit. On the whole, in spite of storms, drought and the panic, the season of 1893 proved as satisfactory, or more so, than the average."

W. B. K. Johnson, of Lehigh, in referring to new varities, writes: "It is rather a delicate matter to say anything about new fruits, as some may think that I am advertising stock for sale. I am, however, testing these new varities to determine their quality and productiveness. During the past season a new raspberry on my grounds formerly unnamed, was, through the Assistant Pomologist at Washington, given the name of "Ferndale." It is one-third larger in fruit, with smaller seeds, better flavored, larger canes and more productive than the Gregg. I have a new blackberry (will be named this coming season), fully as large as the Kittatinny, with less core, sweeter, and at least two weeks earlier, and ten days earlier than any variety on my grounds. Lehigh strawberry is holding its own. Johnson quince, very favorable reports from all over the county. Lehigh Greening and Kocher apples at the lead."

Continuing, on another subject, Mr. Johnson says: "The ornamentation of grounds or homes is decidedly moving forward. Ten years ago we would hardly have dreamed of selling plants to the value of $2 to $5 to a single person, while now it is common to sell bills amounting to $10 to $25. It is not unusual to sell good, large-sized palms at $25 to $50 per single specimen. Colleges, seminaries, and city schools are having their grounds laid out in the most tasteful manner, and this is exerting a grand influence over the students and pupils."

Peter Reeder, of Lycoming, writes: "We have had as many potato bugs as we ever had since they made their appearance here, which was about twenty years ago. They seem to be everywhere. We would be glad to hear of their exit. We have had about all the destructive insects that ever infested this locality in previous years."

Hon. R. F. Schwartz, of Monroe, says: "Unprecendented drought in July and August has injuriously affected the crops and also young small fruit plantations. In some places more than half of newly planted respberries and strawberries are dead."

John P. Fredd, of the "Walnut Glen" farm, near Pottstown (Montgomery county), writes: "As this is a dairy section, it is somewhat difficult for me to give much information about fruit. My own orchard is about the largest in this township. Most of my neighbors are engaged in the milk business. I have a better opinion of the Globe peach than I had two years ago. They did well for me this year; were very large and showy. I sold mine for $1.00 per basket, while Crawfords would only bring 80 or 90 cents. I find that they do not come into bearing as soon as other varieties of the peach. I have grown peaches for many years and I never saw the fruit so perfect. We could hardly find an imperfect peach in five baskets full, but owing to the dry weather and neglect of thinning out the fruit, the peaches were small in size.

My experience in bagging grapes was very unsatisfactory. By bagging, my grapes were prevented from ripening. Some of them never got ripe in the bags, but continued in a green state until frost. Those that I did not bag were all right and ripened perfectly. Probably owing to the dry season, injurious insects were very numerous. Plums all fell off. Apples were very wormy. We will have to spray our trees if we expect to grow fruit in the future. I think there is an opening for a live man to take up spraying trees as a business; to go around among the farmers and spray their trees at so much a tree. I believe it would pay the right man. The codling moth and curculio are the worst insects we have to contend with among our fruit. Tent caterpillars were very few in number during the past season."

W. H. Stout, of Schuylkill, says: "Owing to the protracted drought all crops suffered and insects during this period multiplied rapidly. Fruit and other trees were alive with aphides, ejecting "honey dew" in profusion, so that the foliage looked glazed, and the young leaves curled and were full of insects. Curculio, codling moth and the borer are the fruit growers' greatest enemies. I had some few specimens of new fruits, but considering the unfavorableness of the season defer opinion. I have learned that Grimes' Golden, Northern Spy, Baldwin and others booked as winter varieties are only late fall apples in this locality. We need more good keepers like York Imperial."

John F. Boyer, of Snyder, observes: "The season has fully convinced me that we should by all means thin out our peaches after the June dwindling, as a large peach is better flavored and one basket will put as much money in the grower's pocket as three baskets of fruit not thinned, taking the extra freight and baskets off. No efforts have been made as yet to enforce the Yellows law, which I think should by all means be done, as Snyder, Juniata and Perry counties seem to have become a regular peach belt. More interest should be taken in that direction."

S. M. Baker, of Tioga, writes: "The season of 1893 in Tioga county was not favorable. Fruit ripened prematurely in most cases on account of drought, and decayed badly. Very little attention is paid to spraying by small growers. Plums are almost entirely destroyed by the Curculio, and cherries by the "black knot;" in fact, eternal vigilence is the price of raising almost any kind of fruit in Tioga county, on account of the destruction caused by worms, insects and fungus diseases."

Dr. George G. Groff, of Union, remarks: "I am convinced that apples, pears, peaches, plums, quinces, cherries, grapes and all small fruits suited to the climate, can be grown in Union county, and I am working in this direction. Care is needed in the cultivation of the trees, and in watching insects and diseases. Apples will yield $100 per acre; peaches from $100 to $200; pears as high as $500. The drawback is the time required to grow the trees. I think, however, that farmers who have their homes paid for could not do better than plant 10 acres with fruit. They thus will increase the value of their estates. The scale louse is among my pear trees; it was imported from a nursery. The 'yellows' is also among my peach trees; imported from the same nursery. I feel very badly toward that firm, you may be sure."

Pressly Leech, of Washington county, says: "I never saw any larger apple bloom than we had last season, but it did not come out until after the leaves were out, and we never have a crop of apples when that is the case. Peaches in some localities were very fine. Natural peaches were as large as budded ones and equally as good, while in other places, only a few miles off, they were just as inferior. The black knot is bad on the plum trees with us. The potato crop was a small one, on account of the dry weather. Early ones did best. I never saw larger or better cabbage. The turnip crop was not very large but good."

Theodore Day, of Wayne county, writes: "As to apples there was sufficient bloom, but the flowers were blasted by frosty mornings and east winds. August storms shook all fruit from many trees. On October 14th, a large part then not gathered were shaken off. They were gathered closer than ever, so that hundreds of bushels usually wasted were sold. Yet some people were behind hand with their work and lost part of the crop. The four-lined leaf bug, described by Cornell Experiment Station, in addition to list of plants injured, often checks growth of young leaves, damaging grafts and young trees. Some grafts which I set last spring were damaged by plant lice. All my new varities of apple grafts set for some years past, failed to fruit during the past season. Virginia Albermarle Pippin grafts on bearing trees, large enough to bear for two or three years past, did not yield a single apple that I found. As to pears, peaches, plums, quinces and cherries these fruits might be grown much better by getting hardy, productive and early varieties, and then giving them proper treatment."

In conclusion, your Chairman would state that he has endeavored to bring out the most prominent features of the reports forwarded to him by members of the General Fruit Committee and other prominent horticulturists and fruit growers, and has presented such observations as were deemed fit subjects for consideration at this annual meeting of the State Horticultural Association. Many of the reports received contained no general remarks, but furnished valuable information in regard to the fruit results of 1893. To all who so kindly assisted and gave the benefit of their experiences, your Chairman would return his sincere thanks.

Respectfully submitted,
CYRUS FOX,
Chairman General Fruit Committee.
Reading, Pa., January 16, 1894.

On motion report was received and declared open for general discussion. After a recess of 10 minutes for the purpose of giving members and others an opportunity to pay their dues, Mr. Fox presented a list of 55 names with check for $55, citizens of Reading and Berks county who had paid their dues for 1894. He stated that if the association had met in Reading he would have had 100 names. He stated that on January 7th the last red flag had been removed and the city was virtually free from small pox. He hoped next year to have the meeting at Reading, and promised a cordial reception and a good attendance.

General Discussion.

Mr. Chase.—As a protection against late spring frosts, soft bricks soaked in kerosene, and lighted at night in different sections of orchards, have given satisfactory results. The experiment has been tried in the Cape Cod district, Mass., with encouraging results. I have not tried it in Monroe county this State but expect to do so. Salmon bricks are preferable because they absorb a large amount of oil, and will burn several hours. In reference to apples being blown off by storms in August last, there is a great difference in the hanging qualities of different varieties, and it behooves us to take this into consideration in the planting of orchards. Don't know that I am prepared to name any special varieties. Of pears, Rutter, Anjou and Lawrence lost more by storm than other varieties.

The President. Has Mr. Pierce of Ohio had any experience in this line?

Mr. Pierce. I have not but I want to give the bricks and kerosene a trial. I think they should be lighted early in the evening as it often gets cold before midnight. In regard to varieties of apples for resisting storms the members from your own State would know better than I which to recommend.

Mr. Rush. Smith's Cider hangs better during the storms than any variety I have.

Mr. Woods. Dominie also hangs well.

Prof. Heiges. Young trees will hold their fruit better than old ones. Another point to be considered is the stem. Where it is short the fruit will fall more readily. Select and plant those varieties that have long stems.

Mr. Pierce. We might go still further and recommend varieties with long slender branches. Good, healthy apples, free from Codling moth, also hang better. Rhode Island Greening ought to be picked 2 or 3 weeks before other winter apples. With us the best hanger is Belmont. It is small, and not very profitable. Pecks Pleasant also hangs well.

Mr. Chase. I have in my orchard at least 3 types of Baldwin. One variety looks nearly like King, but not so large. It seems to be different from all other Baldwins. It shows the importance of getting cions from typical bearing trees. The gentleman from Ohio suggests the early gathering of apples. I think many of our Pennsylvania friends make the mistake of letting them hang too long.

Mr. Engle. The blowing down of fruit by storms is not so serious a matter as might be supposed. When trees overbear, the fruit should be thinned and nature sometimes comes to the rescue and thins them for us. We had some experience of this kind the past season in our orchard in York county. Although the apples were reported nearly all blown down, when we came to pick they were still entirely too full. Baldwin and York Imperial especially were overloaded.

It shows that sometimes the forces of nature, while they seem destructive, really do us more good than harm. Although Codling moth and curculio are great drawbacks to fruit culture; without them our apple and plum trees would often be allowed to overbear and crops became a drug in our markets. I admit that the best plan is to destroy the insects and then the fruit by hand, but as the latter is generally neglected, the damage done by insects is not so serious as may be supposed.

Mr. Johnson. In regard to the Baldwin apple there seem to be several different types in cultivation in Pennsylvania. We have three different kinds in our orchard. We have "Tufts Baldwin," a bastard Baldwin, and the regular Baldwin.

Prof. Butz. As going to particular trees for cions, it is generally not considered of much importance. In other lines we must go to individual and not to general types, but the same is true of fruit trees if we wish to make progress.

In selecting pansies for seed for instance, we go to those with finest bloom. Variation in the individuals of a variety is often very pronounced, and too often neglected to die with the plant bearing it. An individual having special merit should always be chosen to propagate from. The farmer who makes a business of growing timothy seed, may help himself by selecting timothy plants with the longest heads, and in time increase the yield of seed per acre. The same principle applies to every department of vegetable life.

In reference to the work of Codling moth, we carried on some experiments at the college, and weighed those apples that were from sprayed and unsprayed trees, and found them usually larger and finer from the sprayed trees, and the total crop of first class apples was heaviest from these same trees.

Mr. Pierce. The riper the apple the earlier it will fall, and Codling moth hastens the maturing of the fruit.

Mr. Hiester. Professor Heiges says that young trees hold their fruit better than old ones. If, therefore, trees are kept thrifty and in growing condition with proper manures and cultivation, and the foliage is kept healthy with Bordeaux mixture, there will be little or no trouble with falling fruit. If we can keep the leaves rich and green the fruit will be much more perfect. If the foliage falls, the apples will also come down.

Mr. Brinser. I find a number of conflicting reports from different members of general Fruit Committee. Is it possible that fruit varies so much. or that they do not have the varieties they believe they have. We know that mistakes occur, and I myself have frequently been deceived. and when varieties fruited they were not what I wanted. If I had not known the fruit I would have condemned the Erie blackberry which some report small and worthless, while with me it is one of the largest and best blackberries.

Mr. Engle. The same question has frequently occurred to me, and I think the variations in fruits are caused chiefly by different soils and different methods of culture. In reference to apples, we have not, like some other States, varieties that do well evrywhere. I do not think we have here one apple that can be recommended for general cultivation. There is scarcely a county that has not one or more local varieties of merit. For many years we went to New York for Northern Spy, Baldwin, Greening, etc., and if we had years ago tested some of our local varieties in different sections of the State, we would, in my opinion, now have a number of good varieties adapted to general cultivation. We have now on exhibition here "Nottingham Brown," a native of this State, exhibited by Mr. Bartram, which ought to be tried in every section of the State. It is fine, and I believe would prove valuable for general cultivation.

Mr. Johnson. I admit that in many instances varieties are not true to name, but much is also owing to soil and culture. Wachusett blackberry, condemned by some, has proven valuable under high culture. As to apples, I would not cultivate those that do well in Maine or New York, but those that have originated in my own county. We have there the Lehigh Greening, the origin of which I do not know, but it is to-day the best apple in Lehigh county. The Northern Spy, though an excellent variety, is not a winter apple with us, and if grown on a southern slope it may be called a fall variety.

Mr. Chase. A few years ago, in trying, at the request of this society, to prepare a list of winter apples for this State, it was a revelation to me that so many persons recommended Baldwin as a winter variety. I know of one nursery firm that has tried to send out and introduce western apples, that promise well in the south-eastern part of the State, but are not entirely satisfactory. In my opinion we must look to the south-western section of the United States, to Arkansas, for a race of apples that will do well in Pennsylvania. I hope in a few years, the chairman of General Fruit Committee may be able to arrange his report in zones or belts, so as to be able to recommend varieties adopted to different sections.

Mr. Moon. I am only sorry our treasury will not permit giving Mr. Fox a farm to test fruits for the benefit of our horticulturists.

Mr. Fox. There is one thing about varieties not being true to name. Experience shows that soil, location and culture are everything, and I can say for Mr. Brinser that he gives thorough cultivation and has one of the best fruit farms in Pennsylvania. Mr. Sutton is another of our thorough cultivators and successful fruit growers, but Erie blackberry does not do well with him. So with many varieties of grapes, they do much better in some localities than in others.

Mr. Engle. It has been stated by some that Erie blackberry and Lawton, are identical. Is such the case?

Mr. Pierce. They are not. I originated the Erie and sent out the original stock. I never sold any since its introduction 12 years ago, and I do not think it was offered for sale until 3 years ago. Am satisfied that many spurious Erie's have been sent out.

Judge Stitzel. There is no doubt in my minds that soil, location, and cultivation have a marked influence on the growth and quality of fruit. In the West I have seen instances where the character and quality were entirely changed, in fact varieties familiar to us here could scarcely be recognized.

Some years ago one of the questions for discussion before this society was whether the tree agent should be encouraged. There was some argument, pro. and con., but the conclusion was that he did much good and should be encouraged. If not induced to plant by the agent, many would never do so. While some, no doubt, are unprincipled and dishonest, they are often censured when they do not deserve it.

Mr. Bartram. While much is due to culture, there is more in the soil than anything else. For instance, the Agriculturist strawberry did well with a neighbor but not with me. Seckel pears do well in some sections, but with me they are not a success.

Mr. Longsdorf. How many varieties of first-class winter apples have we now in Pennsylvania?

Mr. Fox. The list is very short, probably not over halfdozen varieties. About 1886 a fruit list was published and among the winter varieties were such as Spy, Baldwin and Greening, but they are not really winter apples. The Lehigh Greening, however, is known as a winter variety. Fallawater is also a good keeper and I know a party who has planted 200 trees.

Mr. Scherer. I would say there is but one variety of winter apple, and that is Fallawater. So far as my observation goes a wind break is of more importance than any long or short stems. Where my trees are protected by wind breaks I can raise Fallawaters to perfection. We use Yellow Locust for wind breaks and the fruit hangs well until ready to pick.

Judge Stitzel. I must say another word for Fallawater. It keeps better in cold storage than any other variety. We have kept them over the second winter after picking. We also have in Berks county "Bare" and Krauser," two varieties that keep all winter in an ordinary cellar. Both are considered valuable varieties. Some of the "Bare" apples were sent to Charles Downing some years ago and he was much pleased with, and asked many questions about them.

Mr. Johnson. Bare is sometimes called "Dennis." Have it on my list under both names, and it is a good apple. If an apple keep until March I would call it a good winter variety. I have some other Pennsylvania varieties that will keep and are not in our catalogues. Lehigh Greening has a small core, yellow out and inside and can be used for all purposes.

Mr. Longsdorf. When I inquired how many first class winter apples we have in Pennsylvania I did not mean varieties that could be kept by cold storage, but that could be kept in the ordinary way until June. York Imperial is a good keeper and sure bearer, but is not of first quality and scalds badly. It seems to me that by hybridizing or cross-fertilization we should be able to produce a race of long keeping apples adapted to our State and climate. We have experimented with strawberries, grapes and other fruits and have produced very desirable fruits of first quality, and the same is possible with apples.

Mr. Woods. I see upon the table some very fine Lancaster Greenings. I would inquire of Mr. Heister whether they can be grown here as fine as those.

Mr. Heister. Lancaster Greening with me is too good a keeper. I can't get rid of it. It is not handsome, and hard to sell. It is liable to drop its foliage in July while the fruit will hang on but remain small and of inferior quality. If we can destroy the fungus or blight that destroys the foliage we are all right. Our climate seems to produce fungus diseases readily and if by spraying we can get rid of that we can grow apples successfully. We had better try to do that than to attempt to introduce so many new varieties.

Mr. Fox. One reason why more has not been done in the way of experimenting with apples is the long time it requires to fruit and test them. With berries it is not so. Whoever introduces good winter apples in Pennsylvania will be a public benefactor. In Berks county we have no more valuable varieties than Krauser and Kiem, which originated there; or Fallawater, which originated in an adjoining county.

In Centre county they have a variety called "Mann," which is very popular.

Mr. Woods. I hope some one will name the apple exhibited by the secretary under the name of Ben Davis. It seems different from that variety as usually exhibited, and I would like to know what it is.

The Secretary. That is the apple to which I referred in my report to Chairman Fox, and which I recommended as a good keeper, a regular and prolific bearer, and most valuable general purpose apple for family use. Last winter I exhibited it here for a name, and there seemed to be no doubt as to its identity. All joined in naming it Ben Davis. This winter, when exhibited side by side with other specimens, its identity is uncertain. For the latitude in which I live it is certainly a valuable variety no matter what it is.

Mr. Good. We have in our neighborhood in Franklin county a chance seedling which keeps until September. It is conical in shape, not first quality, but excellent for cooking. It is called "Mentzer" or "Snowberger."

Mr. Engle. As to testing new seedling apples the time need not necessarily be long. If we get good cions from one year old seedlings, and graft them on bearing trees they will fruit in 3 or 4 years.

As to the Fallawater, I never heard it claimed as a winter apple. Mr. Sherer's fine, long keeping Fallawaters must be due to some other cause than the wind break protection to which he refers.

Mr. Smeych. The Fallawater is a good keeper if well cared for.

Mr. Sherer. If anyone here thinks Falawater is not a good keeper, I will show him some kept over the season if he will come to our Fair next fall.

Judge Stitzel, chairman of committee, submitted the following nominations:

President.

W. H. MOON, Morrisville.

Vice Presidents.

HOWARD A. CHASE, Philadelphia.
H. M. ENGLE, Marietta.
J. E. JAMISON, Swales.

Recording Secretary.

E. B. ENGLE, Waynesboro.

Corresponding Secretary.

W. P. BRINTON, Christiana.

Treasurer.

J. HIBBERD BARTRAM, Milltown.

Librarian.

THOS. J. EDGE, Harrisburg.

Mr. Moon. While I wish to shirk no duty that may be imposed upon me by this society, I want to say that I am opposed to a third term.

On motion the report was accepted and Mr. Fox was authorized to cast the ballot of the association for the aforenamed candidates who were declared duly elected.

The President appointed,

The President appointed J. C. Hepler, Prof. George C. Butz and D. D. Herr, a committee to examine and report upon the fruit and other exhibits on the tables of the association.

Adjourned.

EVENING SESSION.

After being called to order by the president, and before the regular order of business was taken up, Prof. Heiges and Mr. Fox made brief verbal reports, as delegates from this association to the annual meeting of State Board of Agriculture in January, '93. They reported all delegates present except Mr. Thomas, and that the meeting, was one of the best and most pleasant they had ever attended. Some very interesting discussions were brought out, in which all were invited to take part.

In explanation of the absence of Prof. M. B. Waite, of the Department of Agriculture, Washington, D. C., the secretary made a brief statement and read the following letters from Secretary Morton. The conditons referred to at the close of his letter of January 6, 1894, under which specialists would be permitted to attend meetings of this kind, were in reply to a suggestion by the secretary of this association, that possibly our executive committee would agree to pay Mr. Waite's expenses.

Department of Agriculture,
Office of the Secretary,
Washington, D. C., December 26, 1893.

Mr. E. B. Engle, Secretary, State Horticultural Association of Pennsylvania, Waynesboro, Pennasylvania:

Dear Sir: Yours of the 25th instant is at hand, desiring that Mr. M. B. Waite, of the Division of Vegetable Pathology of this Department, be granted permission to attend the Annual Meeting of your Association the 16th and 17th of January, 1894, to address you on said topic.

At the present time, I do not feel warranted in complying with your request. In the interest of economy, which is so necessary at this time, I am cutting down the expenses of this Department to the lowest possible point. I find that the traveling expenses of the representatives of this Department detailed for platform purposes, is a very considerable item. Such expenditures are not specifically provided for in the appropriations, and it is only by indirection that they can be justified. It has seemed to me, therefore, that good administration will justify me in declining, except in some extraordinary emergency, for the present all such applications. The Department is not a lecture bureau, and there is no money appropriated for a lecturer.

I have authorized Prof. Heiges to be present at your meeting, but it was done largely on the ground that he had already been posted before he was appointed.

Yours truly,
J. STERLING MORTON,
Secretary.

Department of Agriculture,
Office of the Secretary,
Washington, D. C., January 6, 1894.

Mr. E. B. Engle, Secretary, Pennsylvania Horticultural Association,
Waynesboro, Pennsylvania:

Dear Sir: Your letter of January 5, relative to sending Mr. Waite to the forthcoming meeting of your Society, is at hand and has received my careful consideration. I would be perfectly willing to send the gentleman, but if this request is granted there is no reason why others coming from all parts of the country should not be treated in the same way. It would be utterly beyond the power of the Department to grant all such requests, therefore it seems to me that justice can be done only by refusing all. I may say, however, that in case there is no interference with the regular work of the Department specialists will be allowed the privilege of attending such meetings as your own, providing such attendance does not consume too much time and the expenses are borne by the societies demanding the services.

Respectfully,
J. STERLING MORTON,
Secretary.

The Secretary. It is but due Secretary Morton to state that whatever of disappointment pertains to Prof. Waite's absence, is attributable primarily to my assuming the responsibility of announcing him on our programme before permission for his leave of absence was secured. I am free to say however that in view of the precedents we had had in previous years, I felt certain of securing the consent of the Secretary of Agriculture.

Before reading his annual address President Moon stated that Mr. Fox in his paper "Why Pennsylvania fruits were not seen at the World's Fair," would review the work of the World's Fair committee, and his paper would be submitted as the report of said committee.

ANNUAL ADDRESS OF THE PRESIDENT.

"Gentlemen and Fellow-members of the State Horticultural Association." The Scotch poet gave the world a very expressive stanza when he wrote "The best laid plans of mice and men oft times gang aglee," equally true of organizations as of individuals. When this association assembled in this city one year ago we adjourned to meet this year in Reading and accept the cordial invitation of our Berks county members to once more visit their Capital City, renew our former acquaintances and enjoy again the hearty welcome for which the city and county are proverbial. But it is greatly to be regretted that circumstances over which they had no control admitted an unbidden and unwelcome guest to their city whose presence was objectionable and sufficient in the minds of many members to justify the executive committee in holding our meeting elsewhere this year. Our Berks county friends while believing there was no cause for alarm realized that many members would not attend if held in Reading and very wisely we believe waived their claim to this year's meeting, if we would come to Reading next year. They recommended Harrisburg as a compromise with which the executive committee united, hence the change. We trust the association may approve of the action of the committee in thus meeting an emergency for which there did not appear any rule or precedent, and will also grant our Berks county members request to go to Reading next year. There have been times when this association could not get a full attendance or be sure of a successful meeting in Harrisburg, but we believe and hope those days are past. The large and enthusiastic gathering of last year is fresh in our memory, and we can but hope this year's may be equally entertaining and instructive. What are the objects of these annual gatherings, some may query, are they not for those engaged in horticultural pursuits to meet together and compare experiences and results and in this way acquire knowledge both as to what to grow and how to grow, of necessity there may be a sameness and many of the reports and experiences as related from year to year differing only with the seasons. But may we not be benefited by hearing of these experiences? Some of us who have attended these meetings for years recall when spraying was a practice almost unknown and but seldom indulged in. Now, nearly all successful fruit growers spray, and yet there are certain queries on this topic not yet definitely settled in the minds of many of us, notably as to what fruits are benefited and what are injured by spraying. It is claimed by authorities that we are bound to respect that spraying a peach orchard does more harm than good while as regards apples and pears, the Doctors seem more nearly unanimous in favor of spraying.

Nearly all horticulturists and fruit growers are experimenters as well as close observers of cause and effect, consequently these annual gatherings afford an opportunity of learning by the experiences of others, as well as contributing our individual share to the general fund. While we may not be able to learn any cure or preventive for the tornadoes such as swept over many orchards in Eastern Pennsylvania the past summer and blew down large numbers of trees which had to be straightened at considerable expense only to be blown in an opposite direction a week or two later, yet we may learn or become so thoroughly educated in the art of trimming and pruning that we will not have our orchards so top heavy as to be caught by these uncontrollable elements as well as so relieved from unnecessary wood as to secure the very best fruit results as regards size and quality.

The field of Horticulture is an extended one and includes all our fruits and flowers, the ornamental as well as practical come within its scope. It cannot but be a cause of pleasure to members of this association to note the advancement in a horticultural way that has been made within a decade or more in our own State as well as elsewhere, especially near large cities where an increased interest is shown in the cultivation of fruit, both for home use and market by many of those known as our well to do farmers who have found fruit culture much more profitable than raising wheat at present prices. Many of these commenced in a small way, but becoming interested increased their orchards and enlarged their plantings of small fruits until they have become enthusiastic horticulturists who may not expect to become millionaires, but who have abundant reasons to be thankful they have launched into this new field, especially in times like these when those who are engaged in manufacturing and commercial industries are unable to make a living for themselves and families or to continue their business and give employment to those who have heretofore been dependent upon them, such as these now look with envy upon the prosperous fruit grower and tiller of the soil who, though he may not handle as much money, is spared many of the perplexities and losses incident to those engaged in larger enterprises, which in times like the present, are subject to fluctuating values, limited demands and future uncertainty. Let us therefore remember there are many others whose business has suffered much greater depression than ours.

The demand for strictly first class fruit seems to be unlimited, while much that cannot be so classed finds sale at prices that are remunerative. I will cite one instance, the Kieffer pear, that emblem of beauty and embodiment of uncertainty, in a pear which grows with the luxuriance of a willow and possesses the productiveness of the crab. The demand for the crop of Kieffers grown in the Eastern portion of this State the past season has been so great that not only first and second grade fruit brought remunerative returns, but even the thirds were sold at prices that materially increased the net results.

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The uninitiated may think fruit growing is simple as A. B. C., and that no knowledge is necessary to succeed. Experience proves that the old gentleman's assertion that no brains were necessary to make a farmer is equally false, as applied to fruit growing. There are many trials and tribulations incident to those who start on the Royal road to success and fortune in fruit raising.

The adaptability of soil is one of the first and most serious questions to be considered and even the experienced are liable to be deceived, as a rule avoid damp, clayey soil, also one that is particularly susceptible to drought. Fertilizing is an essential requisite and should be done without stint. Different crops require special applications.

The varieties one should plant is a very important question and one particularly calculated to puzzle the inexperienced.

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The country is abundantly supplied with a multiplicity of catalogues naming, describing and illustrating the very choicest fruits of the very latest introduction, giving glowing testimonials and statements of great and marvelous productiveness. These assertions are generally vouched for by many who have seen or tasted, so that it seems unnecessary to question for one moment their truthfulness. The prices of these newly discovered acquisitions are of course only in keeping with the superiority of the new over the old, and as the introducer would have us believe not at all out of proportion to the increased yield that may be expected from these novelties. In addition to this mode of obtaining information and knowledge as to what to plant our novice will doubtless be called upon by the representatives of one or more nurseries who will supplement the descriptions of his new fruits with beautifully executed pictures of the same drawn from life and colored true to nature, or it may be he will have a number of glass jars, (especially if he comes from Ohio), with sufficient magnifying power to present the very fruit itself of natural size, carefully preserved in alcohol and in fact sufficiently tempting to cause ones mouth to water to test the quality before ordering. This opportunity of hearing and learning of the merits of various novelties has thus far cost but little, but the next step must be the deciding one possibly between success and failure. For the decision as to what to buy is an important one and from whom to buy is also important, for there are many honorable and reliable firms who do business by the distribution of catalogues and thus deal direct with the purchaser through the mails as well as many equally reliable who are doing business through their traveling salesmen. So that whichever way you may place your order, try to buy from reliable nurseries and as a rule be guided in the selection of your leading varieties by the experiences of successful fruit growers in your locality and then add a liberal assortment of well selected'novelties. These'will'add much to the interest in watching their results and if some do not succeed as they are represented to do, don't be discouraged, comfort yourself with the belief that either your soil or climate may not be entirely adapted to them. Don't (?) for one moment think the man who sold them to you, told you anything but the truth. The difference in the grade of nursery stock between that of first quality and even second grade is very striking, both the size of the top, and number and quality of roots are quits perceptible. But those who have selected wisely and secured the best are well started on the road to successful fruit culturte, especially if they have had their ground carfully prepared and planted their stock as soon as it was received.

Now thorough, clean, cultivation, careful observation for insect pests and a judicious use of the pruning hook, shears or knife are likely to greatly facilitate the good results for which the attempt has been made. As one becomes more and more interested in fruit raising, much is gained by experience and observation.

And thus probabilities of success increase and our novice becomes a full fledged horticulturist whose name will soon be found enrolled as a member of this or some other horticultural association where he will be an attentive listener or instructive speaker. May the number increase and thus enlarge our membership and our sphere of usefulness.

The Columbian year upon which we had just entered when we last met has become an era of the past and with it the World's Columbian Exposition has had its day and been recorded in history as one of the grandest and most extensive displays of the works and inventions of man that were ever grouped in one exhibition. Thousands from the Keystone State enjoyed the comforts of our beautiful State building and felt proud of its architecture, construction and convenience and were well pleased that this money had been thus wisely expended. Many States, notably those of South and West made magnificent exhibits of fruit in their State buildings which were greatly admired and seemed highly appropriate for them. But we would have regretted such a use being made of our State building. We cannot too emphatically denounce the enforced absence of a creditable fruit exhibit from Pennsylvania among the other fine fruit exhibits in Horticultural Hall where our neighboring States of New York and New Jersey did themselves credit and attained a world wide reputation for their exhibits. At a recent meeting of the New Jersey Horticultural Society one of their leading Pomologists and his two experienced assistants who had charge of their exhibit were able to give such an account of their efforts and successes as any society might be proud of. Why our fruits did not appear at Chicago we shall hope to have explained to us by one who knows. While not wishing or intending to intrude on the subject assigned to another I think it is but due that this society should again make public our utter disgust at the manner in which we have been treated throughout the whole of this World's Fair business and let it be known to the world at large that it is no fault of ours that a horticultural exhibit was not made at Chicago the past summer that would have done credit to Pennsylvania and shown that while our mineral wealth is great our horticultural possibilities are also great. When this association met in York two years ago and received an invitation to take part in making an exhibit at the then coming World's Fair to be held at Chicago in 1893, that would show to the world our possibilities, the invitation was accepted in good faith by the appointment of two members to act in conjunction with others in making a general display of all horticultural products including our native plants, tropical importations, fruits and flowers in their various sub-divisions which it was believed the sum set apart might admit of if economically and judiciously expended. But our hopes were short lived, at our meeting held in this hall one year ago you doubtless remember your attention was called to the fact that nearly all the horticultural products of our State, including native trees and flowers, as well as our fruit exhibit were likely to be entirely excluded and the products from the conservatories of the wealthy and such plants of like character as could be purchased from the establishments of favorite florists were likely to be the only horticultural exhibits made at Chicago as coming from Pennsylvania. This statement brought to us another faint ray of hope by an assurance from those, in charge of the World's Fair Commission then in this city that we should have the necessary funds to make a creditable fruit exhibit at least, if we would name a competent person to take entire charge of collecting and arranging such an exhibit; this was done and we await an explanation. Some may not approve of this criticism of a public commission in this manner, but we believe it to be not only admissible but justifiable for the reason that as the representative Horticultural Association of the State, giving more attention to our fruit interests than any other body, and corresponding to the associations which in other States took this matter in hand and made exhibits so creditable that they redounded to the credit of their States. We should thus explain also because of the fact of our having been invited by the Commissioner of Horticulture to make such an exhibit and having appointed a committee and an expert Pomologist to co-operate, it is but just that our reasons for the non-performance of our part of the program should be thus publicly made known to all should the Chicago search light which shone so beautifully on the waving palms from Pennsylvania (and classed our climate with that of the tropics) shone with the same brilliancy upon the acts and deeds of the World's Fair Commissioners of Pennsylvania we believe it would disclose many things unknown to the general public and such as would not receive unanimous endorsement, not the least among which would be a sum invested in sampling the vintage of our own and foreign climes sufficient to have made a creditable display of all the horticultural products our State is possessed of. Our thanks are due and hereby extended to several gentlemen in authority who rendered all the aid possible in their efforts to secure the recognition and financial aid desired but unfortunately they were of the hopeless minority.

Though an association like ours knows no man's politics, and asks no man's creed save that he is an admirer, follower or devotee of Flora or Pomona. It may not be improper to note the appointment of one of our active members to such a noted position as National Pomologist differing as we may as to the expediency of the discharge of the able and efficient pomologist of the past, Prof. Van Deman, we cannot but comment on the selection of Prof. Heiges, of York, as his successor, and believe that in this act at least Secretary Morton has shown wisdom. We congratulate the Professor on his appointment and extend to him our best wishes for his success.

"While rejoicing with those who rejoice it is but right we should not be unmindful of the sad fact that there are those who have been our co-workers in the past whom we shall see no more. Dr. Calder, whose death occurred in this city the 22d of November last, was one whose pleasant greetings, genial manners and instructive talks won for him our friendship and esteem. We trust suitable resolutions of respect will be offered during the meeting. Another member of former years, and at one time president of this association though better known to us of this decade by the excellent pear which bears his name, has also died at an advanced age during the year. I allude to John Rutter, formerly of West Chester, Pennsylvania, but whose last days were spent in Muncy, Lycoming county. If there have been others whose demise I have failed to note it is from the fact that such an announcement has not come to my notice.

Thus, gentlemen, we see father time continues on his course and his sickle is ever busy. It is the duty of one generation to record the kindly deeds of its predecessor. It is the duty of the horticulturist and pomologist to have increased the happiness, pleasure and fruitfulness of this world by the beauty added, the enjoyment given and blessings bestowed by the faithful pursuance of his avocation, and though it may not be for all of us to have our memory perpetuated and our names go down to posterity in the name of some excellent fruit or beautiful flower, yet it is possible to contribute to the world's good by the cultivation and dissemination of the good things of nature, while here and do all we can to restore the beauties of the original garden around every American home.

The following paper was read by Cyrus T. Fox, Reading, Pa.:

Why Pennsylvania Fruits Were Not Seen at the World's Fair.

In the grand display of fruit made at the World's Fair during the last month of the great exhibition, Pennsylvania was conspicuous by her absence. Most of the States were represented, especially those in which the apple thrives. It was remarkable how well the northwest led off. Iowa and Minnesota surpassed Michigan in apples, the season having been more favorable in the two former than in the peninsular State. Michigan really appeared to great disadvantage, as her apple crop was a failure last year. But it is not your humble servant's purpose to review the fruit display of the World's Fair. Having been asked to explain why Pennsylvania was not represented in that display, I will endeavor to do so as briefly as possible.

When at our last meeting in Harrisburg the matter of making a display of fruit at the World's Fair was brought up, a number of our members manifested a disposition to have nothing to do with it, on account of the very shabby treatment which had been accorded our committee. A consultation was held during the meeting with the officers of Pennsylvania's World's Fair Commission, when assurances were given that if our association would take hold of the matter, ample funds would be provided and the space in the horticultural department would be sufficient to enable a satisfactory display to be made. Thus encouraged, it was decided to make the effort, and the committee of our association asked me to take charge of the work. With considerable reluctance I consented, knowing full well what would be required to get up a display that would be creditable in every respect.

Arrangements were at once made to have Pennsylvania represented in the fruit department, but a difficulty was encountered in the uncertainty as to the amount of money that would be appropriated by the State Commission for the purpose; nor could it be ascertained what space would be allowed in the horticultural building. Calculations were made as to covering 1,500 square feet of space, but later on it was learned that a much less area would be granted, and, in fact, it appeared as though the great Keystone State would be crowded into a very small corner. However, plans were prepared for the erection of platforms and shelving on 1,500 square feet, and for keeping up a display of fruit during two or three months, commencing with the middle of summer and ending with the close of the exposition. The cost of cold storage was included in the calculation, with the expense of having fruit collected in the State and shipped to Chicago, and of keeping the display renewed with fresh specimens of fruit as needed. A sufficient number of attendants were to be in charge. The estimated expense was $2,000, although Prof. H. E. Van Deman, Pomologist of the Department of Agriculture, to whom the figures were submitted, thought the estimate entirely too low, and said that the State ought to appropriate at least $3,000 for this purpose.

After several visits to Harrisburg the plans were finally agreed upon, and it was said that the State Commission would be able to find $2,000 lying around loose that could be devoted to the fruit display. Consultations were then had with different fruit-growers, and everything was considered in good shape for the display, when, in the latter part of March, Commissioner Farquhar called a halt. It was then found that other departments were pressing for money, notably mines and mining, and that it would be very uncertain whether anything could be given for a display of fruit. Everything, it was said, would depend upon the Legislature granting an appropriation of $60,000 in addition to the $300,000 that had been already appropriated. A bill was introduced to give the State Commission the additional $60,000; but I found, upon visits I made to Harrisburg, when I conferred with members of the Senate and House with whom I was well acquainted, that it was exceedingly unlikely that the appropriation would go through. Prominent Senators told me that it stood no possible chance of being passed by the Senate, and they cautioned me to go slow in the matter of the fruit display, and incur no expense. Governor Pattison alse expressed his opposition to the project, and it was evident that if the bill making the appropriation of $60,000, would pass the Legislature, that it would be vetoed by the Governor. Matters being in this condition, and Commissioner Farquhar having ordered me to stop, operations were at once suspended, and no further action was taken in regard to the fruit display.

In August, I received a letter from Commissioner Farquhar, stating that enough money would probably be left out of the original sum appropriated by the Legislature for the World's Fair expenses, to warrant going ahead with a fruit display, and inquiring as to the prospects for getting up a creditable exhibit. It struck me as very late in the day to make this inquiry, and I also noted the uncertainty as to a sufficiency of money, as the Commissioner's letter stated that "enough money would probably be left." However, I consulted officers and members of the State Horticultural Association and others, and visited several sections of the State to inform myself as to the chances, but could not see my way clear to go ahead. President Moon advised against making the attempt, and others did the same. The out-look in the latter part of August was also very poor for obtaining good specimens of fruit. There had been a drought of nearly two months in most sections of the State, which had caused apples to drop, and much damage had also been done all kinds of fruit by hail and other storms in the beginning of July and in August. As it was found that it would be impossible to get up a creditable display, it was deemed inexpedient to put the State to any considerable expense, and then only make a poor showing. Commissioner Farquhar was notified to this effect, and replied, regretting the situation, but conceding that unless Pennsylvania could be creditably represented it would be better not to make an exhibit at all. The matter was, therefore, dropped.

While it was a source of deep regret to me that "Pennsylvania fruits were not seen at the World's Fair," as I had hoped to present the State in its proper light, I trust that our members will regard the action taken as wise and proper under all the circumstances as above explained. I devoted several months to the preliminary preparations for a grand display of fruit at the World's Fair, and had much correspondence on the subject, and it was a great disappointment to me when I was told to cease making further arrangements.

Mr. Fox. I might state further that from all the information I could glean the intention was to crowd the horticultural exhibit of this State to about 300 square feet. At the Centennial in 1876, the exhibit of Berks County Agricultural and Horticultural Society was far in excess of this, and was kept up by attendants for several weeks, as the result of that exhibit, grafts were called for several years afterward, and I have no doubt a similar exhibit by our State at Chicago would have resulted in much good.

THE WORLD'S FAIR.

General Remarks by Some of Those Who Were Present.

Prof. Butz. I have prepared no speech, and will only refer briefly to several points that more particularly attracted my attention. I was at the fair only a short time in August, and was sorely disappointed at what was there in the way of horticultural exhibit. Had hoped to see a splendid display on Wooded Island, as the space there was in great demand. There were large beds of roses, but not a bud or flower on the entire Island. There was considerable growth of fungus, and plants were largely covered with dust and not presentable. In the horticultural building there were many things that lacked previous growth to make them presentable and attractive.

The fruit exhibit was not in the best condition when I was there. The French exhibit was interesting to Americans as showing their methods of training fruit trees. It teaches us that something can be done by proper training. The exhibit around the Pennsylvania building was not representative of Pennsylvania. I saw some cannas and ferns but no general display.

Mr. Pierce. The State of Ohio had only $100,000 to begin with, and of this $8,000 was to have been used for a horticultural display, but we eventually had about the same experience as the horticulturists of your State. The appropriation for this purpose was finally withdrawn and it is really reported that about $10,000 was returned to the State treasury. We were offered in the first place, 2,000 square feet on which to make a display, and finally were offered only 250 feet.

Mr. Fox. Pennsylvania also had about $7,000 refunded, but other incidental expenses reduced the amount to about $2,500.

Mr. Chase. I want to emphasize the point made by Mr. Fox in his paper that if there had been any substantial encouragement given our horticulturists early in the season, Pennsylvania would have made a creditable display at the Columbian exposition. The department of horticulture in this State was placed in the hands of parties who knew nothing of horticulture, and who had no idea of the importance of beginning early. New York commenced her preparations early in the fall by securing choice specimens of fruits and placing them in cold storage. But passing that I want to say that we have in Pennsylvania many beautiful native flowers, shrubs, ferns, trees, etc., that should have been on exhibition, but instead, the grounds were filled with tropical plants which did not represent the horticulture of this great Commonwealth.

Judge Stitzel. I was at Chicago during the early part of the summer, but was called home unexpectedly. I expected to get back again, but was disappointed. I was particularly interested in the California horticultural exhibit, as I have frequently been there, and have seen fruits grow on her own soil. Saw a prune tree 8 years of age, that bore 1,400 pounds of fruit. I would advise any one who has time and means to visit California. It is a very interesting place to any one interested in horticulture. Cereals also do well. They grow 60 bushels of wheat per acre in California and as much as 80 bushels in Washington.

Mr. Pierce. In what way is the extra yield produced as compared to the east?

Judge Stitzel. By the larger and better filled heads.

Mr. Fox. I was forcibly struck at the Columbian Exposition, by the great progress in fruit growing in the northwest. In Minnesota and Iowa they have succeeded well with some varieties of Russian apples. The finest apples came from Washington, and my observations bear out what Judge Stitzel has said about horticulture on the Pacific coast. I had conversation with some fruit growers from Washington and found that they know the value and importance of spraying, fertilizing and cultivation in making their crops profitable. Those in charge of the California exhibit were always ready to give out reports, show their fruits and give any desired information. While millions of gold have been mined in California, her gold production is as nothing in comparison to her fruit and horticultural products. October was probably the best time to visit the World's Fair because the fruit exhibit was then at its height, though during the last few weeks the crowd was too great for comfort or satisfaction. When I returned home I induced parties to visit the fair during its last days, who had not intended going, and no one who went has regretted it.

Mr. Pierce. I would like to inquire of Mr. Fox what varieties of Russian apples were exhibited there.

Mr. Fox. I took no names but saw many Tetofsky from Northern Iowa, where they do so well.

Mr. Pierce. It is generally understood that but few of the Russian apples are worth cultivating. Nothing seems to do as well in the northwestern States as Wealthy and that originated there.

Mr. Chase offered the following preamble resolutions which were read by the secretary, and adopted as read.

"WHEREAS, the Secretary of Agriculture has omitted from his estimates for the next fiscal year the appropriation for the Agricultural Experiment Stations of the United States, which has hitherto formed a regular item of the agricultural appropriation bill, on the ground that said appropriation is not, as the law now stands, a legitimate charge against the Department of Agriculture, therefore,

Resolved, that we, the State Horticultural Association of Pennsylvania, regard the work of the Agricultural Experiment Stations, and that of Pennsylvania Station in particular, as of very great economic and practical value to the farmers of the State and of the United States, and that we hereby request our representatives in Congress to use their best efforts to secure the continuance of the appropriation for its support in such form and under such supervision by the authority as may be necessary to insure that the money shall be faithfully and honestly expended for the purposes designated in the Hatch Act.

Resolved, That we welcome and invite an impartial and thorough investigation,by competent authority, into the management of any and all of said stations, to the end that any abuse, if such there be, may be exposed and corrected.

Resolved, That copies of these resolutions be sent to the Senators and Representatives in Congress from this State, to the Secretary of Agriculture, and to the Director of the Experiment Station."

On motion of Mr. Fox, the secretary was instructed to mail a copy of the foregoing to each Senator and representative in Congress from this State.

On motion of Mr. Chase, Reading was by a unanimous vote, selected as the place for holding the next annual meeting.

On motion of Judge Stitzel the Chair was authorized to appoint a committee of three to prepare a memorial to the memory of Dr. Calder.

Mr. Engle moved to amend by including Mr. John Rutter and any other members who have died during the past year.

The amendment was accepted and the chair appointed Judge Stitzel, H. M. Engle and Prof. S. B. Heiges on said committee.

President Moon called attention to the Query Box, and requested that any one having questions to refer to the society should hand them in. The following questions from the "Query Box" were then read and discussed:

First. "Does Grafting Improve the Quality of Fruit?"

Mr. Johnson. I don't believe it is well to graft winter, on summer apples, or red on yellow. If the grafting is properly done and trees rightly planted the good qualities of the fruit will be continued.

Mr. Pierce. I think if Mr. Johnson will examine apple trees that have been root grafted he will be convinced that the root has no perceptible influence over the cion.

Prof. Heiges. If we admit the theory advanced by Mr. Johnson we would soon lose all identity of the varieties we aim to propagate. Color, shape, flavor, time of ripening would all eventually change, if the stock were influenced by grafting or budding.

Second. "Should Peach Trees be Headed in?"

Mr. Engle. Yes, in order to preserve the shape and symmetry of the tree and to prevent over bearing of fruit.

Third.—"Is there any Practical Apple Picker for Large Crops?"

A Member. Yes, a good active man.

Judge Stitzel—I wish to state my experience as to the result of grafting on large apple trees. I had a number of Bellflower trees that failed to bear. I had a number of them top grafted with "Bear" apple, a late keeping winter variety, and the following year the Bellflower bore as many as any variety in the orchard; it was probably vigorous cutting back which induced fruitfulness.

In regard to heading in peach trees, I think they should be shortened in about one-third.

Fourth. "Who Has Had Any Experience With Japan Wineberry?" Mr. Chase. I planted some in spring of 1892 with considerable prejudice. It has fruited and I confess I am interested in its further trial. Do not know yet that it has any value for market, but I would advise planting a few in your gardens for trial.

Prof. Heiges. I have tested it and much to my surprise I believe it is a grand acquisition. It makes the best and finest colored jelly I ever saw. It may never come into general use as a table fruit, but I would advise a trial of it. It is about as tart as a currant, more prolific than any raspberry and perfectly hardy.

Fifth. "What is the Best Gooseberry in the Cultivation?"

Prof. Heiges. I have Downing, Houghton, Crown Bob, White Smith, Industry, Smith's Improved, Red Jacket and Triumph. I consider Triumph best of all. Greenish Yellow, as large as Industry, and free from hair. It is not a slow grower and very thorny.

Adjourned to 9 a. m., Wednesday.

MORNING SESSION.

Wednesday.

President Moon called the members to order and announced that the treasurer's annual statement would first be submitted.

Having been read and accepted it was referred to an auditing committee consisting of H. S. Rupp and Howard A. Chase, who subsequently reported same correct.

TREASURER'S ANNUAL STATEMENT.

Dr.

J. Hibberd Bartram, Treasurer, in account with State Horticultural Association of Pennsylvania.

1893.			
Jan. 16.	To cash received for annual dues,	91 00	
	To cash on hand per last report,		$212 32
	To cash from Thos. J. Edge,	2 50	
			$305 82

Cr.

1893.			
Jan. 16.	Paid E. B. Engle, postage, express, etc., as per bill,	$28 70	
	Paid E. B. Engle, salary,	25 00	
	Paid Cyrus T. Fox, postage, printing, etc., as per bill,	29 15	
	Paid Cyrus T. Fox, salary,	25 00	
	Paid E. B. Engle, printing, stationery, etc., as per bill,	20 17	
	Paid Thos. J. Edge, as per bill,	2 50	
	Paid J. Haines, janitor,	5 00	
	Balance on hand,	170 30	
			$305 82

Mr Chase. I wish to call attention to the treasurer's statement, and to remind the association that our funds are annually getting lower. Our work is being done at as little expense as possible, and if we wish to continue the good work we should receive some assistance from the State.

Mr. Pierce. The Ohio society gets annually $1,000 from the State. Whatever is not used is carried back into the State treasury. Out of this fund we pay the expenses of our officers and ad-interim committee. The money we get from our membership is "salted down." We pay our secretary $300 per year. The members of ad-interim committee get their travelling expenses paid. Our reports are printed by the State. It seems to me with the vast interests represented here you should be able to get some support from your State. We have also a State Board of Agriculture which has from 50 to 80,000 dollars per year.

Mr. Fox. I am glad this matter has been brought before our association. It is true the funds in our treasury are dwindling down, because we have nothing but what we contribute from our own pockets. This society is doing a good work and deserves support from the State. It has been suggested that we ask for an item for our society in the appropriation bill, but we are told it would be vetoed by the Governor. We are referred to the State Board of Agriculture, and are told that that body should ask for an item sufficient to pay our expenses annually. We ought to have a committee at the State Board meeting next week, to bring this matter to their attention. You all know that our work is conducted economically and at small cost. Last year we made a contract with a newspaper to publish report of General Fruit Committee at a cost of ten to twelve dollars, which in pamphlet form would cost not less than fifty dollars. It is useless to have our reports hid under a bushel for an entire year. We want them published and distributed at once, as soon as possible after the adjournment of our annual meetings. Last year every member of this association, every agricultural and horticultural publication in the county, and leading horticulturists in other States received a copy of report of General Fruit Committee, within a few weeks after its presentation to this society. This should be done every year with our entire report, and if we make an active, united effort, I believe it can be done. I move, Mr. President, that a committee of seven be appointed to represent this society before the annual meeting of the State Board next week, and to make a request for a small annual appropriation.

Prof. Heiges. I most heartily approve of this action and wish to add just a word. Our society represents the only great and important industry that receives no support from the State. Our miners, our manufacturers and other industries are liberally supported and we deserve something at least. I would suggest that the committee to be appointed, be instructed to ask for an appropriation of $1,000.

Mr. Chase. I think it best not to name any amount, but to to leave it to the discretion of our committee. I have felt for years that the State should help us. We should have at our annual meetings not only a full display of our winter fruits, but should invite prominent horticulturists and specialists to take part in our work, and should be able at least to pay their expenses.

Mr. Pierce. We usually pay premiums at our meetings, sometimes as much as $100, is offered on premium list. We also have occasionally one or two speakers from abroad who are paid. We expect to have a fine display of fruits at our coming September meeting.

Mr. Engle. We ought to be better equipped than we are for the important work before us, and by showing what other states are doing for similar societies, we may be able to convince the proper authorities that we are entitled to something. The secretary read a list of the premiums offered for 1894, by the Massachusetts horticultural society, and aggregating a total of $7,900.

The President. This is the only way in which we can increase our usefulness. The idea suggested is a good one, and it will afford me pleasure to appoint a committee to confer with the State Board. Our reports should be published as early as possible after our adjournment, in pamphlet form. Much of their value and interest is lost by the delay in publication. The New Jersey society employs a stenographer who takes notes of their proceedings. Here that duty devolves upon the secretary, who should be free to take part in our discussions, and the general work of the society. I hope the effort to obtain aid will succeed.

The motion was unanimously adopted and the following committtee was appointed by the chair:

H. M. Engle, Cyrus T. Fox, Prof. S. B. Heiges, H. C. Snavely, T. A. Woods, H. W. Comfort, E. B. Engle.

The committee appointed to examine and report upon the fruits, etc., upon the tables submitted the following, which was accepted and ordered to be printed with the proceedings.

Report of Committee on Exhibits.

Your committee has the honor to submit the following report upon the exhibit of fruit. The amount displayed is unusually large and the quality of the fruit is the finest in many years.

The display of Mr. Gabriel Hiester is notably clean of scab and other defects, and is beautifully colored. This, we learn, is largely due to the work of spraying performed on his orchard. It is worthy of special remark that the display from an orchard in Salem, Va., is exceedingly clean, large, highly colored and of very good substance and flavor. This fruit, we learn, has not been sprayed nor especially cared for.

Concerning the other exhibits proper notice is made in the following detailed catalogue:

John Kready, Mount Joy, Pa.:
 1 plate Keystone grape, kept in cellar; long keeper.

J. Hibberd Bartram, Milltown:
 1 plate apples, Winesap, large specimen.
 1 plate apples, for a name, medium size.
 1 plate apples, for a name, large.
 1 plate apples, Smith's Cider, good condition.
 1 plate apples, Nottingham Brown, a local variety of promise.
 1 plate apples, Hubbardston Nonsuch.
 1 plate apples, Roman Stem, small, spotted.
 1 plate pears, Kieffer's Hybrid, large and in good condition.

R. W. Scherer, Manatawney:
 1 plate apples, N. Spy, extra fine.
 2 plates apples, Fallawater, extra fine.
 1 plate apples, Raisin, very small.

Gabriel Hiester, Harrisburg:
 1 plate apples, Willow Twig, in fine condition.
 1 plate apples, Bellflower.
 1 plate apples, Lancaster Greening, fine.
 1 plate apples, marked Seek-no-Further, but supposed to be Hubbardston Nonsuch.
 1 plate apples, Fallawater, highly colored.
 1 plate apples, Cart House or Romanite.
 1 plate apples, Baldwin, large and clean.
 1 plate apples, Esopus Spitzenburg, clean.

J. C. Linville, Gap:
 1 plate apples, Buckley, in fine condition.

E. B. Engle, Waynesboro:
 1 plate apples, marked Ben Davis, in doubt. Not identified by the committee.

Rakestraw & Pyle, Willow Dale:
 1 plate apples, Smith's Cider, in fair condition.
 1 plate apples, Nottingham Brown, in good condition.
 1 plate apples, Red Romanite.
 1 plate pears, Kieffer.
 1 plate walnuts, English.

W. B. K. Johnson, Allentown:
 2 jars Johnson quince.
 1 apple, Guth's Sour.

A. H. Yeager, Greenland:
 2 plates pears, Kieffer, in very fine condition.
 1 plate apples, Ben Davis, highly colored and in fine condition.

Daniel Smeych, Lancaster:
- 1 plate apples, Smokehouse, large.
- 1 plate apples, Red Romanite.
- 1 plate apples, seedling, winter apple.
- 1 plate apples, seedling, winter apple; both in good state of preservation.
- 1 plate pears, Winter Nelis.
- 1 plate pears, Easter Beurre.

Jos. W. Thomas & Son, King of Prussia:
- 1 plate black walnuts, large nuts grown on grafted trees.

H. C. Musser, Rowenna:
Fruit from Salem, Va.
- 1 plate apples, Winesap, very large and remarkably fine in color and cleanness.
- 1 plate apples, Ben Davis, clean and fine.
- 1 plate apples, Newtown or Albemarle Pippin, large and clean.
- 1 plate apples, York Imperial, very large.
- 1 plate apples, Blush Pippin, also in fine condition.

H. C. Snavely, Lebanon:
- 1 plate apples, Pittsburg Pippin.
- 1 plate apples, Strinetown Pippin.
- 1 plate apples, Baldwin.
- 1 specimen apple, Focht, a fine Pennsylvania seedling.
- 1 plate potatoes, Rural New Yorker, No. 2, several large, sound specimens.

T. A. Woods, Harrisburg:
- 1 plate apples, Dominie.

Respectfully submitted,
J. C. HEPLER,
GEORGE C. BUTZ,
D. D. HERR,
Committee.

Prof. Heiges, of the Memorial Committee, submitted the following, which having been read, was unanimously adopted:

In Memoriam.

Whereas, An all-wise Creator, in his inscrutable ruling, has removed two of the most venerable members of the State Horticultural Society of Pennsylvania to a higher life, and being desirous of paying a tribute to their noble and extended labors in the varied field of horticulture; be it

Resolved, 1st, That the society, in their death, has lost two valuable members, who were always ready to impart from their vast fund of knowledge, gained by experience and observation, cheerfully what they had gleaned for the benefit of all interested in horticultural labor.

2d. That we mourn with their bereaved families the loss they have sustained, and shall ever keep green in our memories their kind dispositions and unselfish labors.

3d. That a copy of these resolutions be sent to the bereaved families of the departed.

Signed.

GEO. D. STITZEL,
H. M. ENGLE,
S. B. HEIGES.

Rev. James Calder, of Harrisburg (Life Member.)

From "Farmers' Friend."

The news of the death of Dr. Calder, which occurred on the night of the 22d, will bring a feeling of sadness to nearly all readers of the "Friend." His relations with them as a writer, lecturer and minister, brought him into close communion and formed friendships that cannot be severed without feelings of regret. He was a man of strong intellectual powers, ripe scholarship; a pleasing, entertaining and instructive public speaker and writer of force and elegance. Whatever he undertook had to be well done before it passed from his hands; whether it was the writing of a paragraph or the preparation of a discourse to be delivered before an audience of students, a conference of ministers, or a body of college professors. He could not tolerate careless or slip-shod work of any kind, and we question if anyone ever read a line from his facile pen that did not leave him richer in thought and purer in aspiration than before.

Dr. Calder was a son of William Calder, being born in the old Calder homestead on Market Square, February 16, 1826. He was educated in the public schools of Harrisburg, at the Harrisburg Academy, Partridge's Military Institute, and graduated from Wesleyan University, Middletown, Connecticut, in 1849. In September following he joined the Philadelphia Conference of the M. E. church, and was given charge of a circuit in Lancaster county, remaining in the ministry of that church until 1851, when he was appointed a missionary to China, sailing from New York in the spring of that year. He reached Foo Chow in July following and remained there and in Hong Kong until 1854, when, having changed his views on church polity, he withdrew from the denomination and returned to the United States. Soon after he became pastor of the Bethel church, Harrisburg, serving until 1859. He was in the meantime editor of The Church Advocate, the organ of the Church of God. In 1857, while serving in this pastorate, he took charge of the Shippensburg Collegiate Institute, remaining there one year, when, owing to the death of his wife, he returned to Harrisburg.

In 1869 Dr. Calder was tendered the presidency of the Free-Will Baptist College, at Hillsdale, Michigan, which he accepted and remained at the head of that institution for a few years, when he resigned to accept the presidency of Pennsylvania State College, in 1871. He remained at the head of this latter institution until 1880, and by his profound scholarship and wise supervision over the instructors under his care did much to bring the Pennsylvania State College up to its present high standing.

For some years Dr. Calder was associate editor of the "Farmers' Friend," and in that capacity did noble work for the Grange and for the cause of agriculture. He was in full and hearty accord with the principles enunciated in our Declaration of Purposes, and always ready to advocate them with trenchant pen and eloquent voice. His fine scholarly attainments equipped him for the discussion of any subject in a lucid manner, while his innate goodness of heart would not permit him to write a sentence that would unnecessarily pain another. As a writer on miscellaneous subjects he had but few equals and no superiors. For a few years past other duties pressed so closely upon his attention that he found but little time to write; still now and then an article from his pen enriched our columns. Our readers will miss him; and in the sanctum, where his relations with his co-workers were always of the pleasantest kind, his name will ever be associated with the sweetest memories.

Dr. Calder was for a number of years lecturer of the Pennsylvania State Grange, and was always accorded a hearty welcome wherever he went. Being a practical farmer, as well as a college president, and a man of deep erudition, he was able to impart much useful information to those engaged in agricultural pursuits. Few men enjoyed a wider acquaintance among the people of Pennsylvania than did Dr. Calder, and none had warmer friends; and there is scarcely a township in the Commonwealth in which some will not hear the news of his death with sadness, and call to remembrance some of the excellent things he said while visiting them. He has for several years past lectured at farmers' institutes, under the direction of the State Board of Agriculture, and his services at these meetings were always in demand.

Dr. Calder was twice married, first in 1850 to Ellen Winebrenner, daughter of the Rev. John Winebrenner, who died in 1858, and secondly to Mrs. Eliza D. Murphy, daughter of the late Nicholas Reamshart of Harrisburg, who survives him with six sons and two daughters, as follows: Frank R., of Harrisburg; James K., of Hagerstown, a passenger conductor on the Shenandoah Valley railroad; Russell, an employe of the Pennsylvania Steel Company; William Cary, a missionary in India; Howard L., a lawyer, of Harrisburg; Mrs. Mary Heston, of Seattle, Washington; Wallace R. and Mrs. Charles Small, of Harrisburg. One son, Charles, is dead.

Dr. Calder brought the first Chinaman to Harrisburg on his return from the mission field, Ah Kah, who will be remembered by some of the older citizens. He is now a government official in China.

On last Saturday friends kindly laid him to rest, amid tears of regret and words of praise for the good he had done in his always busy, self-sacrificing life. But, though he sleeps, the thoughts and aspirations he has kindled will live and be rich in fruitage.

John Rutter, Muncy, Pa. (Honorary Member.)

In the last week of the year 1893 John Rutter, one of the original and most useful of our members passed away. Mr. Rutter, although about 87 years of age, maintained his interest in the study of pomology until the last, and never for a moment relaxed his efforts to encourage and foster a love for his favorite pursuit in the minds of others, especially those in the younger walks of life. Notwithstanding his early training as a lawyer at the bar of Chester county, he entered upon the cultivation of fruits and the establishment of a successful nursery business, the latter of which being only abandoned when the increased value of the property necessitated a change. This energetic fruit grower at once turned his attention to the cultivation of peaches, grapes and strawberries, which was continued as long as he lived. Mr. Rutter was perhaps the pioneer vineyardist in our State, or, he was at least among the first to appreciate the value of this industry, and although, owing to an uncongenial soil, he was not very successful, still, with a perseverance worthy of all praise, he continued to procure and test every variety of grape that was introduced. He early engaged in planting peach orchards in Chester county, which were eminently successful, and in the year 1880 he published the result of his experience in a book entitled "The Culture and Diseases of the Peach." In establishing our State association he was among the first to see the importance of thus assembling together for mutual improvement, and to his untiring energy and zeal is due much of the value of earlier meetings. He was the first chairman of our "General Fruit Committee," and in an elaborate and exhaustive paper he portrayed the existing state of our fruit industries, and entreated his fellow-members to extend a fostering care over his cherished pursuit.

No one can say his life-work has been in vain. Others with better opportunities may have accomplished more than he, but that anyone could have infused more spirit and determination to succeed in others, may well be doubted. He has left an example that any of us may be proud to emulate, and our society has been the better for his teaching.

JOSIAH HOOPES.

The following annual members have also died during the past year:

Franklin S. Barnhart, Reading.
Harrison Maltzberger, Reading.

The following paper was read by C. W. Good, Waynesboro, Pa.:

Experience and Observations in Grape Culture.

My subject, as given to me by Secretary Engle, implies that I am expected to state, and state briefly, my method of growing grapes and why I practice such method.

It follows that a composition so environed—construct and figure as we may—necessarily must contain quite a number of the unsavory embellishments I's, my's, me's, mine's and the like. I plead with the secretary for a broader scope, with the hope that you would indulge me in narrations of my phantoms, with their failures, and with my visions that have not yet developed to the point where failure dims and disappointments check enthusiasm. Than to interest you in my personal experience, I would much prefer to be able to entertain you with something like a recital of the prominence of the figure cut by the grape and its products in history from the dawnings of humanity and civilization to the present day, how its clusters cluster with and around man's memory, and how its tendrils entwine recollections, how it consecrated in the hymns and songs of love in the literature of the Etruscans and Phonecians, the myths of Greece and the legendery of the Germans, how it shared the joys and sorrows of the lowly in tents, and the great in palaces and how it associated as richest of foods, with marrow and honey, and as purest of symbols and fraternal love.

I would choose the province to be able to charm you with a diversion from the perplexities and disappointments of ruthless experience, and treat you to a dissertation by the grape for beauty, for utility, for grace of cluster, for delicacy of bloom, for majesty of foliage, for shades and hues of color, for varied fragrance and for unsurpassed flavors. In a sanitary point of view I would direct your attention to the grape as a constituency of a home, where it is easily to the front; its roots and rootlets seek and collect miasmatic, deleterious and malodorus matter and convert the same into nectar for the enjoyments of mankind, and its leaves purify the air. Concerning the botanical classifications of the grape, I desire to confess that with my smattering knowledge of the science, I am right fairly confused. I take it that botanists understand how to classify, and accordingly with authority in hand I proceed to explore a neighboring jungle. I find grape vines creeping, climbing, reclining, entwining and entangling with vine wood of various colors and hues and stripes and blotches; with leaves round, heart-shaped to nearly lanceolate, serrate, toothed, lobed, notched and nicked, and with the distinguishing features, cottony, webbed and smoothe, distinct or suppressed; Labrusca and Vulpina shaking hands across the bloody chasm; Aestavalis and Cordifulia making love to each other, and a numerous offspring of hybrids vainly attempting to perpetuate names and traditions of their ancestors by ostentation of characteristics that are distinguishing features. Returning to my experimental grounds I find the medley little less interesting than that in the jungle in point of diversity; but here I lose my Gray and my microscope, and yield to my abstract nature. "I see the fly but not the barn-door over on which it sits." For the while I see the berries and clusters only. Clusters of Concords, of Niagaras, of Moore's Early, of Brighton, of Moyer, and fifty odd other varieties surpassing the imagination of the artist as displayed in wood cuts, lithographs and chromos in catalogues. The belief has taken hold of me, the faith has captured, that this is certainly the home of the grape. In observations I am much impressed with the healthy condition and faithfulness of the vine, and the great number of varieties that do well. Of my collection the worst variety would be a source of pride and satisfaction were there not so many others that possess qualities more to our liking, but I have had some mildew, some rot, some anthracnose, and I suspect some of every other known grape disease, not however to the extent to damage the one one-hundredth part of the crop. The ripe and ripening berries are often tapped by wasps, rarely by other insects, after which bees and bugs sip the sweets and revel in a kind of feast of fat things. I discover that the wasp's senses for discerning a good quality in grapes are not very dull. The rose bugs, caterpillars, aphis and lice have not as yet been in sufficient quantities or numbers to even attract attention as being injurious. The manner of training and form of support have much to do in checking and preventing depredations, whether by disease or animals. Also quality is much modified by the kinds of support, location, soil and substances used as manures or fertilizers, but in my mind the substances used as fertilizers or manures get entirely too much credit in grape culture, and it has been a question with me whether in a just and impartial account the balance of the benefits and injury would not stand against the manures and fertilizers, even including the great total of all ages. If by the application of manures, phosphates or super-phosphates we delude ourselves into a hope to attain to royal roads, and there neglect the proper support, trimming, training, cultivation, etc., the margin will certainly be against the manures and fertilizers, and depending on the extent of the neglect, largely against them. A few years ago when I thought of planting a vineyard I was confronted with the disadvantage of high-priced land and labor. My location, within six to eight hours by rail from land, and labor in abundance at about one-half the price of that of our vicinity; with the vineyardists of New York being able to get their grapes into our nearest markets, over a distance of about 500 miles, at a freight rate quite or altogether as low as we could procure, though but sixty to seventy miles from the same market, and a general sentiment that ours was not a grape country.

From my observations and experience I saw in prospect in our location, with the proper method, fine clusters and delicious flavors, but they would have to be produced at a small cost, and that they could not be produced on the supports, trellises or frames in common use and often much written about. Nor from manures and phosphates, though good when well used, nor from sprays of copper or arsenical compounds.

But I saw the clusters in certain buds, in certain curves of the canes, in myriads of organisms, however minute, bugs, worms, aphis, and in funguses—or fungi—moulds, spores, and chrysalides, in the judicious stirring of the soil, and far superior to all in point of utility in our subsoils. With a confidence that came from actual practice, I set to—and realized my most extreme expectations I selected a piece of ground that had not been manured since '83. A crop of corn was taken off in '83, a crop of wheat in '84, clover and timothy in '85, timothy in '86, corn in '87, and wheat in '88; In the autumn of '88 I planted 3,000 1 year old grape vines, about ⅓ to ⅜ Concord, ¼ each Delaware and Brighton, balance Pocklington and Duchess; 8 by 10 feet on a surface prepared exactly as for wheat; during the spring and summer of '89 I cultivated corn with the vines, the vines receiving two hoeings by hand; in the autumn and following winter a post or support was placed to each vine; fully one-fourth of the roots were destroyed in digging the holes; and the vines were cut back to within 2 buds of the ground. The following spring and summer one cane was trained and firmly tied to each post; all other branches and laterals that appeared below a point 2 feet from the ground were torn off. The growth of the prefered cane was checked, but once, at the top of the post or support, after which the vines with the arrangements showed their dispositions to imitate the Kilmarmock Willow and the style or method soon took the name "Kilmarmock Style," from an easy running, designating necessity, and cultivation was kept up until about the 1st of August. During the winter of '90 and '91 the branches or laterals were cut off, so that in the spring of '91 there was to begin with a post and straight (not always straight) canes tied together. Cultivation was commenced early in the spring and continued until about the 1st of August, and summer trimming consisted of just so much cutting off ends as would permit cultivator or harrow to pass between the pendulous vines and the ground.

In the fall a fine grape was harvested from the Concord, Pocklington and Dutchess, but very few from the Delaware and Brighton vines. Delaware did not disappoint, as we knew its short-comings, but Brighton's eccentricity of blossom was by me yet unknown; a lack of knowledge that proved to be decidedly expensive. During the fall of '91 and following winter the vines were trimmed and many of them tied to the supports with wire; and the spring of '92 found us ready with main stocks that contained each a few selected curved spurs secured to the posts; and an unshaken confidence. In 'the autumn following when the harvest was ready to gather, with all my hope and expectation I was surprised at the surpassing elegance of the fruit. For quite a time my pleasant occupation consisted of accompanying visitors through the vineyard and listening to and receiving enthusiastic and almost ecstatic expressions and demonstrations. Almost precisely the same care and attention was given for another year with results, a description of which would look like egotism. The only marring influence or occurrence during the last year was the severe storm of 29th and 30th of August, but the crop was not injured to the extent of one per cent. We are preparing now for the crop of '94 which again is but repeating the operation of the 2 years previous.

The reason that I use and admire the Kilmarmock method, is that it is simple; it embraces the best points of other methods; it is a consummation of the application of many years of observation and experience; and it is convenient in stirring the soil. Most of the care and attention given as labor can be performed in comfortable bodily attitudes; it can always be relied upon to produce fine clusters; its umbrella-like protection to the fruit possesses about all the advantages of bagging, without the disadvantages; the pendulous branches encircling the stock being knit together by the tendrils, gives elasticity, which affords continued resistance against wind and storm; trimming being reduced to a simplicity can be done speedily; the selection of cluster buds is a certainty; the clusters hang quite free from entanglement; little summer pruning is required; there is little danger of mildew and rot, because of the even distribution of the sap from the stock; the resistance against disease is supported speedily and surely by the general equilibrium of the structure; and with all and not least of all it is beautiful. In cultivating i. e., stirring the surface soil, I use the implement at hand, that will best meet requirements; the first plowing in the spring may be done by a single shovel or scoring plow, which may be followed by a spring harrow, next by a cultivator, and then again by a harrow, etc., usually, I manage to employ the implement or implements that answers best for the day, to accomplish my desires, among them a Morgan grape hoe. The intervals between the stirrings of the soil depend a good deal on the weather and inclinations; my vineyard gets a good many stirrings.

I like the action of the old single shovel plow for the first plowing early in the spring, for ridging, mixing and covering any litter that may remain on the ground from the previous fall and winter, besides

I like to confuse and disarrange the arrangements of the surface roots, that lazily—and because they can—monopolize the sap producing substances that lie easily within their reach.

I have bar-sheared and would continue to do so, if it were not for the unavoidable bankings and dead furrows. As the season advances the depth of cultivation is diminished to about 2 to 3 inches of surface mulch. The quite small space around the collars of the stocks and parts that cannot be reached by horse implements are hoed and weeded twice during the early summer by hand. During the time between the 1st of August and 1st of October, '92, the weeds grew so luxuriently that scythe was sparingly used in preference to harrow or cultivator, from which save in appearance, there was no damage. During the time from 1st of August to 1st of March, I cultivate and propagate the earth-worm and myriads of living creatures and forms of life. They are friends that do not talk a fellow out of his wits and money, like the fertilizer agent. The grapes are fed to the "Gold Bugs."

Pruning or trimming, as a diversion of my subject after the second year, consists in shearing off nearly all the growth of canes of the previous summer, leaving only a few short spurs, which should be selected as nearly as possible for their strength and rather sharp curves near the axis with the main stock; the spurs should be located and distributed as evenly as possible on the main stock from a point not lower than 20 inches from the ground to the top; care should be exercised to prevent too much spreading of the top; while a few new spurs located on old spurs may not be objectionable and may be necessary sometimes, a system of selecting new spurs from the ones located at the outward extremes of the old spurs would eventually destroy the whole method. The spurs should contain not more than 20 buds not including the axillary ones. The vine properly trimmed according to the Kilmarmock method need not and should not differ much in appearance with its convergency for many years. I have already mentioned that about all the summer trimming necessary is just enough to facilitate cultivation, but should the growing vines persist in using their neighbors as annex trellises, they must be checked by cutting or pinching the ends. I am not much of a foliage destroyer.

The habit of tying or training grape vines to single stakes is not new, and I suppose as far back as any man knows, never was new; we have seen it, heard of it, and read about it; it has been practiced in curves, in bows, in circles, in links, in loops, in angles, and in many other geometrical fashions. The Kilmarmock resembles the stump method in some particular. The single wire method in some, and the Kniffen and many other methods in many other characteristics. Most of us tied vines to single stakes, but very few of us ever were satisfied with a single post or stake for a trellis; most of us wanted more grapes than we thought could be produced by a vine tied to one stake without appendages. That is the ambition that I flung away. By the Kilmarmock method, I get about all the avoirdupois of grapes from an acre that an acre ought to be allowed to produce. Too much is generally expected from a vineyard. It should be remembered that there is no rotation of crops. If I were asked to name the worst enemy to the successful growing of fine grapes, I would answer—Avarice.

In the Kilmarmock method we have all the forces directed to one common head, i. e., the top of the stock, a kind of storehouse where are deposited for immediate use and as a reservoir to meet emergencies, the collections by the roots and leaves. Assimilation and elaboration can proceed regularly and efficiently, and whether the enemy attacks either extreme or at any point, the forces of resistance are at hand and under control of one head. The flow of the sap is facilitated, and has its proper checks and obstructions. The foliage radiates to the rays of the sun, and is exposed to light and air evenly and perfectly, and the earth is exposed to the suns' rays, except just where it should not be, and that—considering the height of the structure—affords to the foliage and berries about all the benefits of temperature from the ground that is possible with any system; and moreover the structure is such that it is able to receive and utilize such benefits. Some varieties of grapes do better by one system than another, all tried do well with the Kilmarmock system, according to the varieties, characteristics, etc.

I will next pay a passing attention to varieties, this alone is subject enough to fill almost any imaginable space or paper. I have already said the worst of my collection would satisfy me if there were no others, pardon me for quoting, "Full many a flower, etc." The "desert air" in our case, is the multitude of varieties. You would not like to have me take up your precious time by describing varieties, I would like to say a good word for 40 varieties, they deserve it. Some season however a variety may not reach its full measure of excellence according to its characteristics, seldom a fault of its own, but by a little patience it usually turns in and redeems itself. For general usefulness, Concord stands first. If I were the Concord grape instead of your essayist, I would need no tombstone. Moore's Early in my mind, comes to the second place speedily. I class it second for general usefulness, with Brighton third, Niagara fourth, Delaware fifth, Worden sixth, Pocklington 7th and Vergennes, Wyoming, Woodruff, Moyer, Dutchess, Nectar, Early Victor, Geneva and Eaton, pressing claims for promotion. Green Mountain and Moore's Diamond have not fruited with me.

Cottage deserves special attention for flavor, hardiness and vigor of vine and foliage. Rogers Hybrids though possessing special excellence and aromatic flavors, lose favor for a lack or hardiness of foliage, Mills and Highland lose favor for lack of hardiness of vine, Nectar deserves special notice for flavor and general hardiness. In the mention made of Worden I probably differ with the general opinion of admirers of grapes. I would class it third in table, second in foliage, third in vine, second in cluster, third in general appearance, sixth in general usefulness, tenth in shipping qualities, double-tenth in wasp resisting qualities. The wasps and bees have fun with it, and it reciprocates by bursting its own skin sometimes. I may have a better opinion of it in the future, when I get more of its vines to fruiting.

For varieties that are characterized for earliness, I place Moore's Early, Moyer, Victor, Telegraph, Jessica and Hartford's firsts; Worden, Wyoming, Brighton, Delaware, Lady and Hayes as seconds.

Concerning the wine qualities, I will say without fear of contradiction, that the greatest sources of wine, are the great city hydrants, the sugar hogsheads, a little application of chemistry, a few green or immature grapes and bug juice, straight to suit the taste; I have even heard that some persons take "a fly" in theirs.

I have used manures and fertilizers in my experiments, but not on the vineyard yet; I will use anything that I think will be needed, but I do not think that barnyard or special manures will be needed soon. In my mind, it is about as rational to waste grape food, as any other kind of food. It is about as unreasonable to place unnecessary manures within reach of the grape roots, as it is to place large quantities of concentrated food within reach of an unreasonable animal, and about as indiscreet as to feed a dyspeptic person on pork pudding.

Manures, phosphates and super phosphates are good when they are needed, but not always economical. Raw bone attracts animal organisms, moulds, etc., and therefore may be said to be always good. You can make plant food out of them, by the super part of the phosphate or by the plow.

I do not like too much forcing of the surface roots; too much of the force of the vine is directed to the surface roots by indiscreet manuring; too many plethoric surface roots act too strongly on the stock during wet seasons, and play the robber during drouths. This is not entirely a new idea, but is a furtherance of the theory that requires the pruning off of the surface roots against the stock, i. e., cutting the roots away so that the manure cannot be used by the plant from the top soil. I reluctantly here end my remarks on fertilizers.

I have been trying to direct your attention to the use of the Kilmarmock system in vineyard practice. It is just as efficacious in point of aspect and utility, for use about country homes and suburban resiresidences. The supports can be made higher; the training can be directed to produce whirls with intervals between; the stock can be divided with less disadvantage than many other methods; the division trained to different parts, and to almost anywhere in the sunlight that man may desire to climb and erect a post for a support. The greatest enemies to the young grape vines about buildings are cats. I quote, "The foxes, the little foxes spoil the vines," and here state that, the cats, the little cats trounce the buds and young shoots off the young vines. I've watched them at it, and I know they do it. I protect young vines with wire gauze. Turkey chicks are fond of the young buds.

Too much cannot be said in favor of the uses of the earthworm in the vineyard; without its meanderings we fail to see how roots could spread in the sub-soils. You no doubt all have read, that, the Germans practice turning and pulverizing the earth in preparation for vineyards to the depth of from 3 to 5 feet, with conviction that the roots of the vine could and would go downward. I cannot afford to work the ground to any such depth. I plant the vine and depend on the earth-worm for root courses through the sub-soil.

An average earth-worm weighs about 1½ scruples. I weighed one. One earth-worm to each square foot of surface makes nearly 50,000 to the acre. Fifty thousand earth-worms make about 5 bushels of 50 pounds each. Two to the square foot makes 90 or 100,000 to the acre. Three to the foot makes about 14 to 15 bushels to the acre. These with other organisms that aggregates to about another similar quantity of animal matter, not to be overlooked by the vineyardist, and cannot be imitated, or supplied by substitution.

My experience has taught me to be careful about the application of manures, especially phosphates, with the "super" prefix.

Mr. Engle. Mr. Good is to be congratulated on his success. He may continue a while longer, but I predict he must sooner or later resort to fertilizers of some kind. No soil is inexhaustible, and we cannot take from it any more than we put in. There are certain soils in the west where corn has been grown 40 or 50 years without manure, but they have eventually become exhausted. Mr. Good's method of growing and training the grape is not altogether new, but is an excellent one. A principle which I have always observed with profit in training the vine, is to train weak growers or vines on a thin soil, vertically; while strong growers, or on rich soil, should be trained on the "Kniffen" or any pendant system. The former method increases the vigor, while the latter checks rampant growth. Unless rampant growers are checked by some method there will always be too much vine at the expense of fruit, and to secure the best results I know of no better system than the "Kniffen" for rampant growers.

Mr. Hiester. I was much interested in the essay just read. While the essayist has applied no fertilizers as yet he made a guarded expression when he stated that he did not intend to fertilize until it was necessary. He agreed also that raw bone is a good fertilizer for grapes. I have grown the vine on a plan similar to that of Mr. Good, but instead of one vine I grew three. I would like to inquire how he prevents the lower buds from dying out after a series of years.

Mr. Good. You have a division of your stock, and consequently a division of your forces. Take any single vine, from the ground or from an old vine on a trellis, and tie it to a single post so that it forms a head above, and treat it according to the Kilmarmock method and you will have fine grapes, no matter how many poor and insipid ones hang on horizontal and inclined canes located below the Kilmarmock head. I have no trouble about fruiting buds. Your losing fruiting buds no doubt is caused by not recognizing the fact that there must be a head, and that, for best results, should not be longer than 12 to 18 inches. My experience (and it is long) is, that the older the stock is, the better the results are.

Mr. Snavely. In 1882 I planted a number of vines and trained them to one stake. The lower shoots were as vigorous last year as when planted. By the single cane system we can have as much vigor at bottom of vine as at the top. I can endorse the system the essayist advocates. If I planted 20 acres next spring I would train on same plan. I can also endorse his views as to the Morgan grape hoe.

Mr. Bartram. I have about one acre trained in a similar way. I can grow grapes readily, but find they do not pay as well as some other crops.

Mr. Pierce. I think Mr. Good's system of training is similar to that pursued in California and eastern countries.

Prof. Heiges. I suppose all the fruit-growers present are familiar with the experiments conducted by Rev. Stephen Hales more than one hundred and fifty years ago.

By means of a mercury gauge he estimated the vital force of the sap of the grape vine.

This force has been found sufficient to counterbalance a column of water 49.52 feet high.

We have no desire to philosophize upon the character of this force, whether vital, special, electric, attractive, repulsive, osmosic or any other, but the fact remains that the sap reaches the most remote buds of a vine and on its return feeds and develops them first, and if the supply be not sufficient those nearest the ground (if trained vertically) or those near the main stalk (if trained horizontally) are the ones that remain dormant.

This law of nature accounts for the great height to which wild grape vines which have attached themselves to trees, eventually become barren of buds, and all foliage and fruit are found on the highest parts of the tree that the vine has reached.

I venture to assert that if Mr. Good's plan is carried on a few years longer he will have no fruiting wood near the ground.

We see this on every old grape arbor in the country on which the vines have not been properly pruned.

The only remedy in such cases is to cut off the old wood at the ground and start new canes. Do not be afraid to prune intelligently.

Dr. Jabez Fisher pruned one different vine each day in his vineyard for a period of fifty days, beginning the first of May, and found no difference in the growth, the pruning being all finished before the new growth was developed. No. vineyardist who ignores pruning can be successful for many years.

Mr. Johnson. Mr. Good's plan may do for a while, but I do not believe it will continue to be a success. We grow different varieties here from those grown in California, and they require different training and treatment. The plan upon which I train the grape I first saw about 27 years ago, when on a visit to Germany. The principle could be best explained by a diagram, but I can give you the idea verbally. The vines are grown on horizontal wires 3 or 4 in number and about 12 inches apart. The first year I grow but one eye. The second year I cut it back to the lower wire about 20 or 24 inches from the ground, let two or more eyes grow, if but one strong, I tie that to the lower wire, if the cane is very strong I may cut to have six good eyes on the first horizontal arm, if weak less, tie one of the strong growing eyes in the opposite direction, extending every year as the vine gets stronger, until my vine covers about four feet in each direction or eight feet. Care must be taken, for if too long a cane is left any one year, not all the eyes will start, and there may be too many blanks or open spaces. The object is to have all the eyes start, particularly those on the upper side of the cane. Should it be a short-jointed variety, if too many eyes, some may be cut out to give room for the bunches to form and grow. When carefully treated the vine appears like a rake, being shaded from the hot sun, with ventilation for the air to pass, also having a good covering as a protection from dew. After the vines make a few inches growth I examine them, breaking out all the lateral or non-fruit bearing canes, leaving nothing but those intended to bear fruit. In pruning, I cut back to three, often to two eyes, never allowing more than one cane on last year's growth. In this way, I have, every year, the same number of cane after once properly started unless one should die. I then leave two to fill the space, though this seldom happens. I grow as large and fine flavored berries as I have tasted anywhere, and seldom see larger and finer bunches, and until I see an improvement in flavor and size of bunches, I am satisfied with the method I have explained. I have experimented with over 100 varieties, have now 69 varieties on my grounds, but will have less in a year or two, for when a dozen, or at the farthest 20 varieties are selected out of the whole number, we have all the profitable varieties, and for vineyard culture it would fall below a dozen varieties that could be recommended. The amateur may find a dozen or more for variety's sake, and the balance are comparatively worthless in our soil and climate, doing better in other states than in ours. I might state that I have for 15 years grown grapes successfully by the system of training referred to.

Mr. Engle. Mr. Johnson's plan of training the vine is a modified system of the old French or "Thomery" plan. He will get up a little higher every year and must eventually cut back his vines and get new wood near the centre of the stock. The lower buds and vines will get weaker every year.

Mr. Longsdorf. I have no doubt the single vine will succeed as well as any for a while, but I believe it must be renewed in course of time. In California the idea is to start new vines from the ground. Have seen vines in vineyards there as thick as my arm. I saw the large "Mission Vine" near Santa Barbara, covering one fourth of an acre and bearing three tons of grapes in one season. The main vine is 14 inches in diameter and is on a trellis. As to fertilizers, what does Mr. Good do with the refuse leaves, etc.?

Mr. Good. If it did not require too much time and expense would plow it in.

The Secretary. While the questions of grape culture is under discussion I wish to call your attention to a paper in my possession bearing on this subject and which it would be well to have read now. It is from the pen of one of our horticultural friends in Illinois. Mr. Leon Hay, of Kankakee, and gives an account of some very successful results achieved by Mr. A. P. Bonvallet, a Frenchman, who settled near him some years ago. If there be no objection I will read it. It is entitled:

Some Profitable Uses For Apparently Worthless Soils

Crossing Kankakee county, Illinois, diagonally from northwest to southeast is a narrow strip of sand ridges and swamps. About all that naturally grows on the ridges is a few scanty oaks and sandburrs. This kind of land is not worth $5 an acre for ordinary farming, still on the poorest of these ridges some thirty years ago Mr. A. P. Bonvallet, a Frenchman, from the grape district of France, having read that Phyloxera could not damage grape roots growing in sand, purchased near the village of St. Anne, a quarter section on which to establish a vineyard, which he first started on a small scale, experimenting year after year with new varieties. For about ten years he tried the methods of cultivation of his native country, but always without profit until he almost gave up in despair, still dreading to throw away such an amount of work and expense he continued his experimenting as best he could and since which time he has been successful, and now profitably grows on these sand ridges a large number of varieties from the well known Concord to some of the choicest European varieties. The latter is a thing which has thus far been impossible to do profitably in this country, but which he does by grafting on roots of the native varieties of which he has special methods of his own, as well as for trimming, training and pinching back, at the proper seasons according to what his long experience and experimenting have taught him that each distinct variety requires best. The same principles he also applies to the culture of native grapes.

Mr. Bonvallet's success being due to his long persistent and extensive experimenting which makes him to-day the most successful grape grower in Illinois. He also had by far the greatest number of varieties of grapes collected from one grower in the Illinois Horticultural Exhibits at the World's Fair.

As to the details of his methods he tells nobody, keeping it as secret, saying it has cost him too much to learn. Once or twice he has hinted that if any individual or association wished to know all he had found out they would have to pay for it. So all that can be told is only what has been seen.

His vineyards are planted in rows about 10 feet apart and running on the hillsides in the direction they will be most exposed to the sunshine, the direction depends on the position of the ridges none of which are over 20 feet high. The rows are also protected from early morning sunshine, either by ridges or natural groves, to shield as far as possible from increasing damages from late frosts after vegetation has started. Vines are trellised on one wire only which is about four feet above the ground. He seems to prune a great deal leaving but little old wood, and he also seems to have a special method of pruning for different varieties which to fully describe would require some study. Most varieties are pruned in the fall and covered with swamp grass, not straw. He claims straw fosters fungous diseases. All vines are uncovered in spring as late as vegetation will permit him to leave the hay on and next it is stacked all over the fields where convenient.

Should there be danger of white frost after the buds are started he makes smoky fires all through his vineyards in latter portions of the night by burning trimmings, leaves and damp hay, thus evading the frost; this is seldom done more than two or three times in a spring. He seems to pinch back a great deal, exposing the fruit to early and late sunshine, but protected from midday sunshine. He fertilizes with both commercial and natural fertilizers but not extensively with either. He does not spray—although spraying has paid me wonderfully the past season—he believes more in fighting disease with natural agencies, such as plenty of free air circulation and sunshine. Having visited his vineyards each of the past four years the amount of grapes his vines bear each year is wonderful, many vines bearing each a bushel or even more of fruit. Some of his choice European varieties he has sold as high as 19½ cents per pound. He sells mostly to the home market. Ships mostly to Chicago and a little to other large cities wherever he can get the highest price, and makes wine of all the surplus. Last year, owing to the abundance of grapes everywhere, besides selling considerable he made 4,000 gallons of pure juice wine from his surplus. Besides having now about 40 acres in vineyards proper he has planted between most of the grape rows a row of asparagus of which he also makes a specialty, and grows these of such size and quality for which Chicago epicures pay the highest price, the asparagus rows and vineyards being planted together cover an area of between 60 and 70 acres. He claims that the asparagus are allowed to grow up, after all danger of their harming the grapes is past, and they grow before there is any danger of the grapes harming the asparagus. No other weeds but the sand-burrs trouble him in such soil and these he leaves grow in the latter part of the season to keep the sand from drifting. The old gentleman and four young men is all that is employed for all this work, only a few extra hands are employed in asparagus time. Neighboring to him, but on the lower grounds, Dutch gardeners have settled and are increasing in number rather fast from year to year. They are making a success of celery, cucumber, and other vegetables. They have succeeded in growing nearly as large Bermuda onions as the imported ones, and for a few years past older settlers have developed quite an industry in melon culture on the sand ridges, many car loads are shipped each year. It is not uncommon to find specimens of 50 pounds and 75 pounds and over for watermelons has long ceased to be a curiosity.

All these facts show that even the poorest soils can be turned to even very profitable use in some cases, and that if more thought was put into Agriculture and Horticulture and less in moving to the cities, there would be no need of establishing free soup counters nor fear of panics, for our soil is capable of producing far more than it does if it is only studied as to what it can best produce.

LEON HAY.

The President. We have with us to-day Dr. Schaeffer, State Superintendent of Public Instruction, and who is a member of our society. We will be glad to hear from him.

Dr. Schaeffer. I came in yesterday to pay my dues, and came today to listen, not expecting to be called upon to speak.

You are engaged in a good work and one in which our public schools should take more interest. In France it is now obligatory on the part of the schools to teach primary horticulture. The trouble in our own schools is that at present few or none of our instructors are prepared to teach it. I hope next year at your annual meeting this matter will be discussed, and that you will give your views as to what should be taught in this direction and how. I believe that the growing of an apple tree is of more importance than a problem in cube root or quadratic equations. There is as much good thought in the topics discussed here as in a discussion of mathematics. I hope this matter will have further attention next year when you come to my native county of Berks.

Mr. Snavely, of Lebanon, Pa., read the following paper:

Potato Culture.

The potato is from time to time assuming a more important position in the dietary, not only in this country but in many nations of Europe. Like corn, it is a contribution of the Western continent to the food supply of the world. In several European countries the production is marvellous as compared with the production of our country. Germany alone, with a population about two-thirds of that of the United States produces more than five times as many potatoes, and exports but a small percentage. Several other European countries largely exceed the supply of the United States. This is worthy of note, when we consider the great disparity of arable areas.

It may be contended that this valuable article of diet has not received the attention its importance demands.

In this paper I shall confine myself to the subject of culture, leaving other phases of the subject, such as its value as food, etc., to those competent to discuss the same.

In the cultivation of the potato there are three essential requisites, a good soil, good seed and good cultivation. By a neglect of any of these conditions it is not possible to attain the best results.

A sandy loam is probably the best for the potato, though other soils can be put in conditicn to produce paying crops. My experience is confined to gravelly loam and limestone clay soils, and on both have grown good crops. The former is easier of cultivation and on the whole is preferred.

Land in ordinary tilth and fertility may yield good crops in favorable seasons, but to be sure of a satisfactory yield when the conditions are not favorable, requires a thoroughly prepared and highly enriched soil.

This means good plowing and thorough pulverizing and the application of the plant foods, in an available form, in sufficient quantities.

A clover sod, plowed in the fall, with all the growth after haying left on the ground to be turned under, is my preference, and all other things being equal has invariably given the best results. On such lands good crops can be grown with a comparatively small outlay for dung or commercial fertilizers. The clover leaves the soil rich in nitrogen, and this element which is the most costly in commercial fertilizers, is supplied by the clover. The potash and phorphoric acid with a limited amount of nitrogen must be supplied according to the fertility of the soil. The potash, if used separately, or in a prepared fertilizer, should be in the form of a high grade sulphate, where the chlorine is eliminated. Wood ashes are excellent, but are not always to be had in quantity or at prices to warrant their use. I would not use kainit or muriate of potash unless they were applied in the fall, for I think the tendency is to make "soggy" potatoes, some claim that by the use of muriate of potash a larger yield can be secured, but at the expense of quality.

In my opinion better results, both as to quantity and quality, can be attained, by the use of fertilizers, than by the use of barn yard manure. The quantity to be applied depends on the fertility of the soil, but applications, on most lands, of from 600 pounds, to 1,200 per acre, will bring satisfactory results. On clover sod I would prefer a fertilizer analyzing 10 per cent. phosphoric acid, 8 per cent. actual potash, and 2 per cent. ammonia. One corn stubble or on land where clover was not so recently grown the ammonia should be increased.

The seasons of 1892 and 1893 were not favorable to potato culture, owing to long seasons of drouth, but I had the best results on sod ground and where I broadcasted the fertilizer, harrowing it in before planting. But I might state that for early varieties having a short season to grow I would apply fertilizer in the drill or trench.

As to shallow or deep planting, I favor the latter, though I would not advise heavy covering at planting, but full up when the plant shows above ground. I am certain more potatoes can be grown to the acre in this way than by placing the sets, but a little below the surface.

The Seed.

What is good seed? A sound, well grown tuber, the variety of which has not degenerated. It is well known that varieties "run out," sooner in some localities than others, and such should be discarded for seed.

Potatoes to make good seed should not have the sprouts to start before planting. There is a marked difference in varieties as to vigor of plant, and one making a strong growth, developing a heavy vine and long, heavy sorts, is a more certain cropper in all seasons. The potato with a light vine may do in favorable seasons when there is sufficient moisture, but if you want a stand-by select a variety that makes a large plant. Some varieties are more subject to blight and rot than others; these are too risky to trust, for blight stops growth and starts rot. Disease is often a result of degeneration, whether an old variety or of more recent introduction. Scabby potatoes should not be used for seed, for the chances are that the crop will be scabby, and moreover such seed is lacking in vitality.

It is claimed by some that soaking the seed in a solution of corrosive sublimate will destroy the scab germ. The following is recommended: Four ounces corrosive sublimate to thirty gallons of water and soak the potatoes from one to two hours.

Should blight appear, or there be a probability of blight, a spraying of the Bordeaux mixture is advisable. I have on several occasions found this profitable. My practice is to plant in drills three feet apart, and the cuttings about fifteen inches apart in the drill. As near as possible two eyes are left to a cutting, for this I believe gives the best results. Soon after potatoes are cut they should be planted, unless they are well dusted with gypsum, to prevent heating. Several years ago I had an experience in leaving the cuttings in the trench for some hours without covering. Fully 25 per cent. failed to grow. Cover as soon after dropping as possible.

I have no experience with potato planters, and from all the information I could get, I incline to think that on high priced land, where every foot should yield, hand dropping pays best.

Cultivation.

Cultivation should begin whenever the weeds start or the ground becomes hard. Breed's Weeder is a valuable implement in the potato field, before the plants are above the ground, and as long as they are small. The time to knock out weeds is when they are small.

Later on the cultivator is used and the ground worked to a considerable depth. This should be done as soon as the rows can be seen, and the cultivator run close to the row.

From this on, the success of the crop will depend on cultivation, and the keeping of the vines clear of the bugs. The bugs must be fought vigorously for the difference of a day in the application of the insecticide may mean the difference between profit or loss, and this especially in a dry season. As the vines grow larger and the roots strike out cultivation should be more shallow, for deep cultivation will break the roots, and sight must not be lost of the fact that every rootlet is a feeder and adds to the size of the tubers.

Cultivation should be continued as long as the vines are green and never should the bugs be allowed to mutilate the plants.

Mr. Johnson. Mr. Snavely has not explained how he cuts his potatoes for planting.

Mr. Snavely. I can explain in the most practical manner by cutting one of the specimens on the table.

Mr. Johnson. I believe the support and vigor of the eye depend upon the size or length of the piece.

Mr. Hiester. I think not always I saw 150 bushels grown to the acre from parings.

Mr. Bartram. Has any one had any experience in thinning potato vines? I have a neighbor who always thins them row by row, pulling them out by the hand, and who claims they grow stronger by so doing.

Mr. Pierce. Has anyone ever had difficulty in selling very large potatoes?

Mr. Snavely. Have never had any trouble to sell, but have seen very large tubers sell in Philadelphia at 50 cents, while medium size brought 75 cents per bushel.

Judge Stitzel. I believe nothing has been said in reference to the size of potatoes for cutting and planting. I think best to use large potatoes and cut them. The planting of small tubers year after year has a tendency to decrease the size and yield. In California, they raise in some sections, three crops annually. The first crop is planted in February and is taken out in about fifty days. They then plant again, selecting large and old potatoes for seed, for second and third plantings. In California when handling potatoes, wheat, etc., nothing is known of bushels but everything is sold by weight. I think it is the fairest way, and that our laws should be changed so as to buy and sell by weight.

The President. Some reference was made in Mr. Fox's report about a bug in Franklin county that is injuring the potato. Who can tell us anything about it?

Mr. Brinton. I think I know the bug referred to, and it is never very injurious to the potato vine. It usually gets on the under side of the vines, and apparently, cannot stand the sun.

One point in particular which the essayist emphasized, is the importance of utilizing the first and earliest eyes or sprouts. I have noticed in my experience with bulbs of all kinds in the green-house that the first effort is always the best. All subsequent efforts are weaker, until finally there is almost no effort at all.

Mr. Pierce. We had all over Ohio hundreds of acres of potatoes ruined by a bug which is probably the one referred to. I myself lost three-fourths of an acre. Tried Paris Green but it did not kill them like the Colorado beetle. The only way to get rid of them, was to drive them into furrows and burn them. The tramping of sheep, seems to alarm them, and they leave.

Prof. Heiges. There are two kinds of potato beetles. This one has a probocis like an elephant, and sucks the sap from the lower side of the foliage. It can't be poisoned. It is the old style potato beetle we had years ago before the Colorado beetle.

Mr. Pierce. It is evidently not the kind we have in Ohio. It is known there as the "Blister Beetle" or "Spanish Fly."

Mr. Brinton. This potato bug is an annual visitor. We always have him but his presence is not very serious. It does not eat the foliage but sucks the juices from it and can't be poisoned.

The following paper was read by the President:

HORTICULTURE AS AN ADJUNCT TO AGRICULTURE.

By H. W. Comfort, Fallington, Pa.

In these times of universal depression in the agricultural world, when wheat is only worth sixty-five cents per bushel, corn forty-five cents per bushel, and other staples selling below cost of production, the successful farmer, like the successful merchant, must change his business and adapt it to the altered condition of the age. If our society has a mission larger than the selfish one of merely helping the few horticulturists who are its members, I deem it lies in persuading our Agricultural brethren to adopt a diversified farming, by becoming the growers of horticultural products.

In my neighborhood, asparagus has been with some very profitable, and the acreage is yearly increasing. The careful grower within one hundred miles of large cities, if he has good railroad facilities, can easily compete with our Jersey farmers, for Pennsylvania asparagus sells in Philadelphia at 25 cents per dozen bunches higher than the Jersey product. An agent of the great wholesale house of Thurber & Co., once told me that they preferred our nice green product to the pale white cutting of our sister State. Our farmers easily expect to sell their crops at $200 per acre, at a net profit of $100, and a bed once old enough to cut, which is the third year, after planting, brings in a never failing return for years, regardless of frosts or of warm or severe winters.

Then to those having the same good shipping facilities, or better still, those having a good home market, the growing of small fruits offers an attractive and lucrative variation.

After twelve years of experience with strawberries, I think I can safely say that a gross sale of $250 per acre is easily obtained. To do this, plant the varieties which experience soon teaches you are the best adapted to your soil. Grow them in rows four feet apart, and only let the beds get 18 inches wide by fall. Kill all weeds as soon as they germinate and cover in early winter with a mulch of about 20 tons of good horse stable manure. By doing this, you will in the spring be rewarded by a fine growth of fruit stalks and leaves which will barely leave enough path for your pickers to walk in, and your expenses will figure about thus: Manure $40, picking $60, labor, commission, etc., $75, and profit $75, or more than most of the farm land in Pennsylvania will bring to-day. For me the Crescent Seedling, and Sharpless, are the best.

The growers of raspberries, especially those who grow the black varieties, find an equally profitable crop, and the growers of currants perhaps a still better one. My acre of currants was planted eleven years ago in a young apple orchard with the rows 7½ feet apart. The first few years I grew a row of celery, beets, or other vegetables between the rows, and every sixth row is left out to make a roadway for handling crates and manure. Since they grew large enough to need all the ground, they have only had two coats of phosphate and one of manure, but now I hope to give them a liberal mulch of manure each year.

In looking over my returns, they show a grand total of $2,736. Taking one-third for picking, it leaves $1,824, or an average of $167 per year, including the first three years that they were unproductive. To all appearances they will continue to do the same, and if the $67 is used for labor and manure, we can count safe $100 each as the profit, provided we never put off for to-morrow killing the currant worm that hatches to-day. In these days of Fay's Prolific, and other improved varieties, the gross and net returns may be better, though many growers claim nothing equals the Dutch varieties.

To those who have not the advantages of good home markets or of rapid transit, the small fruits may not be so profitable but to these, as well as to the rest of us, the growing of orchards is possible, and if properly handled, profitable. To-day I have more faith in the Keiffer pears than in any other farm crop, and if they should fall as low as 50 cents per bushel, they will still pay well. An orchard of Kieffers planted 20 feet apart, or 100 to the acre, will soon yield two bushels per tree, or 200 bushels per acre, and at 50 cents we have $100. Trees from six to eight years old will often yield 3 bushels per tree on an average, and this fall buyers came to the orchards and bought them in the heaps at $1.00 per bushel. My 400 trees had 600 bushels, or $600 of fruit and the expenses were not heavy.

If you ask why I mention Kieffers and not other varieties, I reply, they do not come in competition with peaches, cantelopes, melons, or other fruits, as the Bartletts and many other pears do, and are in the market about Thanksgiving, are an excellent cooker, in fact, I think the best pear to cook, I know of, are good keepers and so pretty that they sell themselves. People often say they are not fit to eat raw, but thousands of bushels are eaten annually and will continue to be eaten until something just as profitable and much better has been found. Two years ago quite a number were exported to England, and the West Indies, and found ready sale at $4 and $5 per bushel. Men who have had orchards of from ten to forty acres are now planting farms of them, but the demand keeps up with the supply and many a housewife has discarded the Bartlett and now waits for the Kieffer. In my judgment it will be many a day before they will net less than $100 per acre, or $1,000 for a ten acre field of one thousand trees.

Apple orchards also may be made a very profitable adjunct to the farm and with care can be made to yield a good revenue almost from the first. In the spring when you plant your orchard, set it out also with all the small fruits. Strawberries yield the following year, and the others in three years, and the thorough cultivation necessary to success with small fruits will enable your trees to make splendid growth. If your orchard is too large to use it all in small fruits, make your truck patch there, also your potatoes, but I do not advise a regular farm rotation for a growing orchard.

Thus several years of paying crops can be grown, in fact, currants and raspberries will do well for twelve or fifteen years and then your apples will pay for themselves and need all the ground, after that time I would not work an orchard, but seed to grass and then if you buy or raise young pigs with judgment, your waste will net $25 per acre. I run five or six pigs to an acre, and like to have good shoats in the spring and they will nearly live on the grass and fallen apples until early fall, then sell at a good price to the sausage makers. The fallen apples made into cider for vinegar also help up the revenues, when your pigs do not eat all of them. After the pigs are in sausages, your poor apples not fit for market, ought to go into your vinegar casks. If you have five or six pigs to every acre you will not need much fertilizer, for they will evenly cover your orchard with the best of manure, and will help your fruit by eating the many worms. On an average you ought to get 100 bushels of good apples per annum, per acre. In this county (Bucks), we expect a good crop from a tree every other year, and they are often sold at public auction on the tree at an average price of $2 per tree, or $50 per acre, the purchaser doing all the picking, sorting, packing, etc. Your waste product in pigs and vinegar will more than pay all expenses of trimming, auctioneer, etc., and the $50 is your net revenue.

Now I have tried to be conservative in all my figures, basing them on several years of practical work with fruits, having 25 acres of apple and pear orchard, 5 acres of strawberries, and less of currants and raspberries, I can safely say that if a man had 10 acres divided between strawberries, currants and raspberies, he ought to clear $750 from them, and ten acres of Kieffers at the present prices, $1,000 and ten acres of apples $500, or a grand total of $2,250. If you do not care for the smaller fruits, have 20 acres of each 100 of your farm in apples, 20x50 or $1,000. Will your other 80 acres yield in the same proportion?

These facts show you the good of "Horticulture as an adjunct to Agriculture," and the sooner our farmers learn to diversify their farming the better, and the labor comes in very nicely with other farm work, and varies the monotony of the farmer's life.

In closing, let me drop the caution to all new beginners in orcharding, to be very careful of whom you buy your stock. Do not buy of every tree agent who may chance to call on you, for if you do, disappointment will probably be your lot. Your stock may not be good and probably will not be true to name. Only buy of firms of acknowledged reputation and only varieties known to be profitable in your immediate neighborhood. An apple that is a grand success in one county, or State, is often an utter failure in another. If you want to try new varieties, or varietieslittle known in your section (and we all like to experiment) content yourself with one or two trees at a time. Before planting an apple or pear orchard have a definite object in view. If you expect to ship at a distance, have but few varieties, for two reasons, first there are only a few varieties that are profitable to ship, and second, when shipping you need to have enough to get the best freight rates. Of pears we can only recommend, Clapp's Favorite, Bartlett, Anjou and Kieffer, and of apples, the late fall and winter varieties. If near a home market, plant to have a succession from the very earliest to the latest. Of pears we recommend Buerre-Gifford, Clapp's Favorite, Bartlett, Seckel, Sheldon, Anjou, Lawrence, Kieffer and Rutter, and of apples, (if planting an orchard in Bucks county), I would plant June Eating, Red Astrachan, Sweet Bough, White Carver, Maiden's Blush, Porter, Summer Pearmain, Cornell's Fancy, Townsend, Fall Pippin, Holland Pippin, and Baldwin, Nottingham Brown, Smith's Cider, Ben Davis, Nero, Roman Stem, Newton Pippin and Ridge Pippin. These lists would have to be varied slightly in each locality. By having a succession you can daily or tri-weekly, supply families if your orchard is small. If large you can supply the fruit dealers, hucksters and grocers their fresh fruits most of the year, and in supplying this kind of trade, aim to have something for them all the time, or else your more enterprising neighbor will steal away your trade.

Always grow the very finest, and take the greatest care in sorting your fruit, a few seconds on a basket of firsts, will make them all grade as seconds, while the careless appearance of a package will often take off 20 per cent of the price, or much more than the profit. On the other hand care will soon give the grower a reputation that will half sell his crop, especially in the time of glut. The young man who plants and grows a nice orchard carefully, becomes very much attached to it, and is not apt to say "farming does not pay." On the contrary he says, farming and fruit growing does pay, both directly in cash and indirectly in healthy families, made more healthy by liberal diet of fresh and cook fruits. Cultivate a love for the business. Some are born horticulturists, others by perseverance, intelligence and business ability become such.

Adjourned.

AFTERNOON SESSION.

The following report on flowers and fruits at the Experiment Station of Pennsylvania State College for 1893, was read by Prof. Geo. C. Butz, the Horticulturist at the college.

The originators of new varieties of horticultural products are beginning to realize the great benefit which the experiment stations'may be to them. The time had come when so much fraud was perpetrated through the introduction of new varieties by the use of deceptive illustrations, and high sounding descriptions of all the desirable qualities and excellences of the novelties, which proved so often to be unfaithful, that no honest description confined to the truth of facts was sufficient to launch a truly good and worthy thing upon a successful career, all extravagance in description and illustration was considered as advertisement necessary to success, and this success sometimes led to the retaining of an old variety of fruit or flower, applying a new description full of the highest praise and thus swindling the public in a somewhat innocent way. The experiment stations are beginning to exert a checking influence upon such fraudulent practices, and the originator, whose reputation is his capital, is anxious that his customers should find his products equal to his claims. It is becoming customary therefore to send promising novelties to be tested at the stations and receive an official report before or as soon as the novelty is ready for extensive introduction. On the other hand, the public will benefit by the protection afforded by an official oversight upon the new fruits, flowers and vegetable offered for sale.

The control of fertilizers has a fixed duty and value in the agriculture of this country, and the seed control stations of Germany have done much in maintaining the purity of seeds, and similarly it is legitimately the work of our stations to prevent fraud in the introduction of horticultural novelties, which is becoming more extensive each succeeding year. Your secretary requested me to make some report upon this kind of the work being done at the Pennsylvania station, and after collecting a few results, I realized that it would be a long and tedious paper to cover the entire field, and therefore I will not attempt to do so. I might properly preface this report with a brief exposition of the relations between the originator and the station as fixed by the horticulturists in convention. The originator must send the plants, scions, or seeds prepaid, and only of such as have given some promise under his own observation. A minimum number or quantity of each article is stipulated:—as, 2 dozen strawberry plants, 2 fruit trees, 6 raspberries, and so on, and if less are sent, no report can be expected until the station has propagated the proper number of plants from which to take its records. On the other hand, the station will not sell or distribute in any manner, the material novelties, and generally guard the interests of the originator in his control of it. Besides caring for such acquisitions the station adds by purchase other vraieties that will probably be of special interest to its patrons, and thus disseminate information to the public.

Within the last two years nearly 200 varieties of evergreens have been acquired and planted in the expectation of finding some valuable kinds suited to Pennsylvania, which will afford a greater selection of graceful and beautiful conifera for the ornamentation of extensive grounds and parks. It will be necessary to learn about these trees such points as their hardiness, how the color of the foliage is affected by winter, how the habit is affected by our climate, how easily transplanted, how rapidly they will reach an ornamental size, how soon they will reach maturity, etc. Such work is being extended also in the lines of other ornamental plants.

The selection of the larger fruits from among foreign sorts and the new ones originating in this country requires a briefer term of years than is necessary for a study of the development of a tree. It is a very slow process to introduce a new fruit of this class, and those which do appear are generally traced to an accidental origin, dating back many years. This, of course, will continue to be so, largely from the nature of the case, since no man can foresee any pecuniary returns for his own lifetime.

With regard to the small fruits, however, such reward may be expected, and the work of manufacturing, as it were, new varieties is more generally undertaken.

Strawberries.

There are but few troublesome questions in the cultivation of the strawberry, and when these are properly answered the cultivator will find this crop a very easy and profitable one to grow. There is no question about soil, since the most excellent results have been obtained from all conditions of soil that will grow weeds, retain moisture and permit of easy cultivation with horse and hoe. There is diversity of opinion in regard to growing the plants in hills free from runners, or in the matted row, but this diversity of opinion is no greater than the diversity of results obtained from experiments upon this subject.

It is customary to grow the plants in matted rows because this method requires less attention in cultivation. The berries are kept clean, no mulching being necessary for that purpose, and as there are more plants per acre, the yield is presumably greater than in the "hill system" of cultivation. Arguments that carry some weight are frequently put forth in favor of the latter system, and trials are made upon a small scale by the market gardener, but never with sufficient accuracy and attention to determine the relative merits of the two systems. The recent crop has afforded us results touching upon this question and they will be read with much interest by persons cultivating the strawberry.

Among thirty-five varieties planted side by side and cultivated in the two ways, twenty-four yielded heavier crops in the mat and eleven in the hills. The total yield from mats was ten per cent. better than the total yield from hills. The weights of the first pickings, June 12, and the last, July 5, were greater from mats in each case by about fifty per 'cent. Kentucky, Crescent, Van Deman and Governor Hoard were better in hills than in mat.

In a direct comparison of fifteen varieties with the results of a similar experiment at the Michigan Station, there seemed to be agreement in only six of these; and of these fifteen varieties we find only five favoring the hill system, while Michigan Station reports nine out of fifteen favoring the hill system. The inference here is that there is not sufficient regularity in results from different sections and conditions of soil and climate to claim undoubted superiority for either system of cultivation.

The question of varieties will always be an open one, because of the continual addition of new ones having new and greater merits. The quantity, time and quality of yield will be the principal criteria to judge this matter by. The heaviest yield of all the varieties tested last year, numbering forty, belongs to the Greenville by the mat system. This variety has borne a good report as long as it has been grown here. The berry is large, ripens well, of good color, comes early and stays late. There was a quart of berries for every eight inches of row calculated from the total figures of yield. The next in largeness of yield was Shuster's Gem, another new berry of great merit. The roll of honor in yield and beauty of berry, as made up from the reports of this season, is as follows: 1 Greenville, 2 Shuster's Gem, 3 Ohio Centennial, specially noted as the largest berry which ripens well and has a fine color and flavor; 4 Parker Earle, though one week later than the earliest, the yield was heavy and of good berries; 5 Van Deman, one of the earliest with a medium sized berry and a constantly good yield through three weeks; 6 Crescent, this good old standard must at last acknowledge defeat in point of yield and suffer greatly from a lack of quality in its berry; 7, Crawford stands next in order of yield and can boast of a good and medium sized berry; 8 Wilson's Albany, 9 Governor Hoard and 10 Charles Downing. The five earliest varieties were, in the order of the heaviest yields at the first picking, 1 Mitchell's Early, 2 Van Deman, 3 Crescent, 4 West Lawn and 5 Shuster's Gem. The five latest varieties were, in the order of the heaviest yields at last picking, 1 Parker Earle, 2 Townsend, 3 Crawford, 4 Eureka and 5 Kentucky.

By observing the newer varieties, in the light of recent experience, and considering each by itself, the following special notes are derived:

Van Deman is classed as a vigorous plant, making runners only in a moderate degree; the foliage is slightly affected by rust, but not seriously. The berry is medium in size, ripening evenly in a bright dark red color, the flavor is pleasant and very sweet. In yield of fruit the past season, when all varieties were perhaps doing their best, this variety excelled Crescent. It can be recommended for extensive planting, as well as for the more limited and direct use in the home garden. The flower is perfect.

Shuster's Gem is one of the most vigorous and healthy plants of the present improved sorts. It mats up a row almost as rapidly as Crescent and Kentucky. It has fine looking berries from the beginning to the end of its yield. The fruit is large and ripens evenly; the flesh is firm and sweet. The seeds are deeply fitted and the calyx is large. The flower is nearly perfect.

Governor Hoard is a good berry and will generally give satisfaction as a large berry. It is remarkably hardy and fairly productive. It has been tested at various experiment stations under the label Loudon No. 15.

Greenville is a recent introduction from Ohio. It is deserving of much praise and extensive planting. We have tested this variety for four years, although it has been exposed for sale only two years, and we can recommend it with even higher praise than that of a briefer experience. The plants are strong growers, matting rapidly, and have been quite free from rust, as compared with its neighbors in the field. The berries have the size of Sharpless, being very large, but excel in ripening evenly. The flavor is sweet and of good quality, and its productiveness was far above any other tested. It began ripening with Crescent, but yielded profitable pickings five days longer.

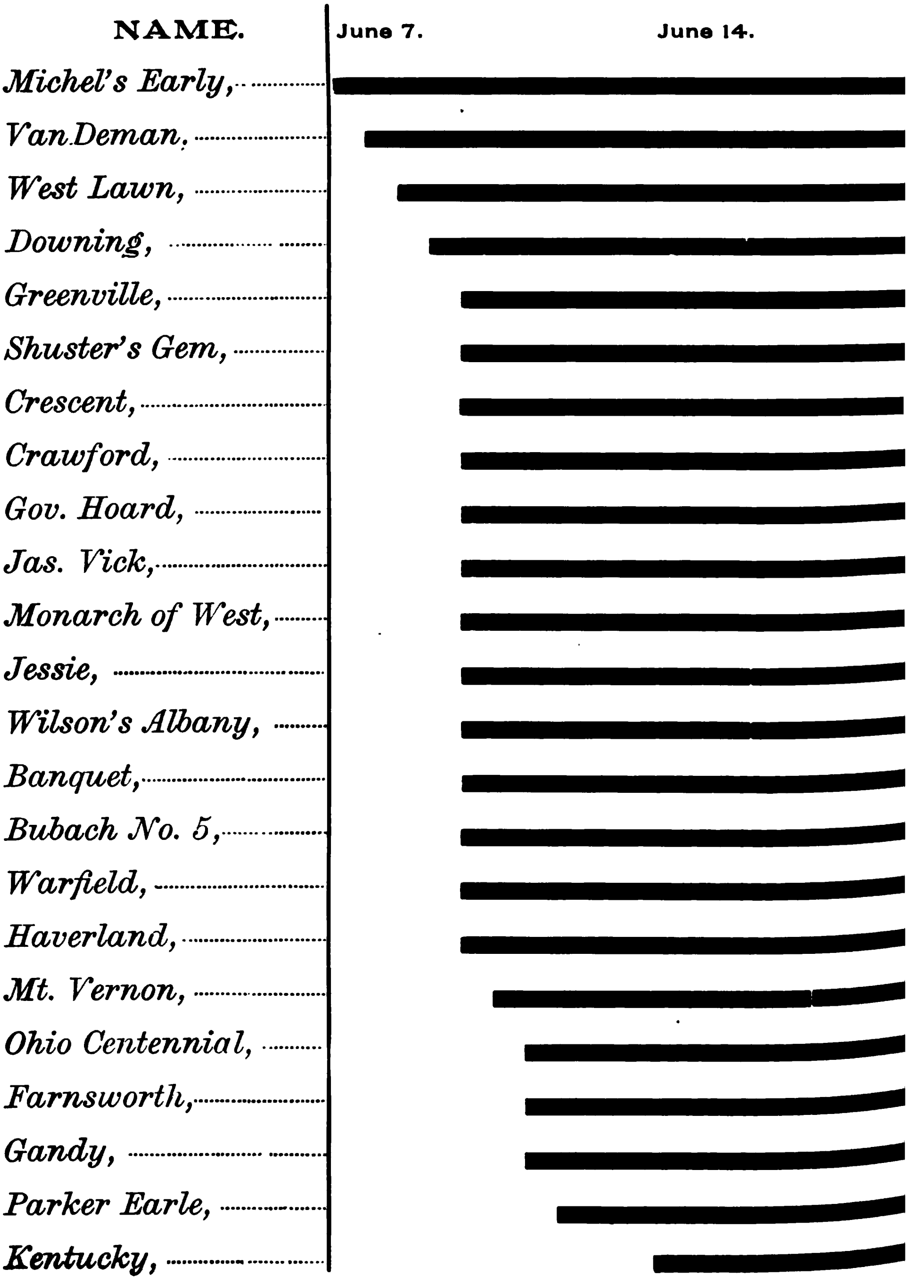
Banquet is a variety from New York State, which we have tested for three years. Its berries are medium in size and bright red in color, but lacks in productiveness, is backward in making runners and does not possess great vigor.

Michel's Early ripened several days before the general crop began, but lacked too much in its yield to be of much use. After the first week, the pickings were very much lessened. The berry is round, medium size, light red and sweet, but too soft for shipping.

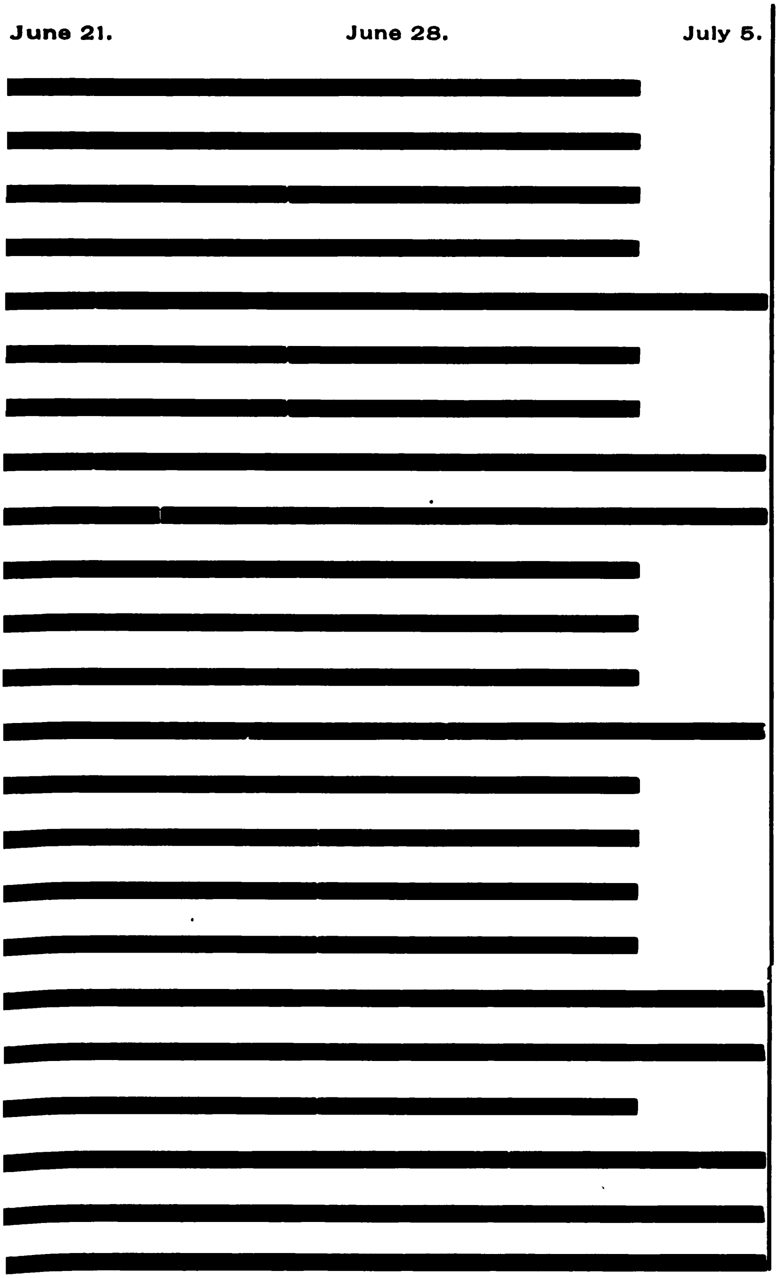
West Lawn is a variety from Arkansas. It has a very fine berry that is remarkably sweet, with solid substance and fair size. The flowers are imperfect and the plants show excellent vigor. Another season is necessary to make a full test of its productiveness.

PENNSYLVANIA STATE COLLEGE

STRAWBERRY CH



T FOR CROP OF 1893.



YIELD IN GRAMMES.	
24 Hills.	30 ft. Matted.
1040	3217
*6024	5285
*1632	1278
3210	4977
6880	9552
6828	7632
*5875	5287
4720	5758
*4225	3997
*3120	2180
*2519	2172
1948	2902
3713	5280
2192	2987
*1478	929
2074	3962
1695	4020
1859	2163
*7350	4007
2038	3932
770	1192
6864	7320
*3744	1855

Crawford has several pronounced qualities that stamp it as a profitable strawberry. It is scaled with the highest degree of vigor, the freest from rust and the smallest number of seeds in the berry. This is elongated, light red, large and solid, with a sub-acid flavor and a record for yield in its second year equal to that of Crescent. Its period of ripe fruit extended through three and one-half weeks. It deserves attention from our large growers.

Warfield has generally sustained a good report from different stations. Its fruit is dark red, large, broadly conical, with a very large calyx. It ripens well, has few seeds and the yield is a profitable one.

Haverland, like the preceding, is more or less known in cultivation. The plants are vigorous, producing runners freely. The berry is long conical, with a smooth neck under the large calyx. It is scarlet, with a solid substance, and altogether making a very good appearance. The yield is very good for two and a half weeks.

Ohio Centennial is a new variety from Ohio, yielding the largest berry yet produced at this station. The substance is solid and sweet, the color light red and the calyx is very large. The plants are large and vigorous and the flowers perfect. The highest success with this variety is attained by growing in hills. In this the second season from planting the yield of fruit in weight was next to Greenville, the highest of our tests. It is a late variety.

Of the many other varieties on trial several show excellent traits of character, but require a more thorough test before a faithful report can be made.

Raspberries.

A new plantation of raspberries was made two years ago, and these plants came into excellent bearing in the past season.

It is an easy matter to secure enough raspberries for home use from a few plants, little regard being paid to the selection of variety or location of the bushes in the garden. He who grows for market, however, will profit by a little attention to the kind of berries he produces. In color he may have yellow, red, purple and black, and in Pennsylvania he will find that none of them require winter protection. For yellow, the Caroline and Brinkle's Orange are very profitable berries. For red, the Marlboro, Cuthbert and Rancocas. For purple, Shaffer's Colossal, and for black the Souhegan, Mammoth Cluster and Ohio. These are all well tested varieties which can be recommended for productiveness, covering a period from June 20 to August 1, with profitable pickings. New varieties appear each year and demand some attention from berry growers. Among these the following have been tested at this station:

Ada. The plant is strong, with a whitish green, thorny stalk and bristly hairs on the fruit stems; the berry is not large, although the several drupes are large, making the berry rather soft. It is reddish black in color and slightly acid in taste. One season is not enough to determine productiveness, but the berry itself has little to recommend this variety.

Brackett's 101. A very vigorous plant with thorny stems, foliage slightly attacked by rust. The berry is very large, in fact the largest blackcap in our garden. The several drupes are large, with a rather firm substance that is sweet and possessed of a good flavor. Another year is necessary to determine its earliness and productiveness.

Columbian. The plants and berries of this variety resemble Shaffer's Colossal. These two are of a type very different from the other raspberries. Columbian is described by its originator, Mr. J. T. Thompson, of Oneida, N. Y., as a seedling of the Cuthbert grown near the Gregg, and therefore believed to be a cross between the black and red raspberries. It is a prolific bearer and a most vigorous grower; the canes this second year from planting are erect and from six to eight feet high, the berries are very large, purple, and in total yield there was nearly twice the weight of berries from the best red or black variety.

Older. The plants are vigorous, with light purple, thorny stalks. The berries are very large, round, and in colo range from purple to black. They are quite soft, slightly acid and in flavor cannot be considered excellent. It ripens late and finishes early. Nothing can be said of its bearing qualities at this writing.

Smith's Prolific. Stout canes are produced by this plant and its fruit is borne in large clusters. The berries are very fine, being of medium size, made up of small drupes which are very black and sweet, possessing a good flavor. When the plants have made a good stand they should produce a large yield of fruit, which another season might prove to us.

Thompson's Early Prolific. The principal merit claimed for this variety is its earliness, which was not marked in this, its first fruiting season with us. Pickings were made continuously until August 1. The berries are very large, light red in color, with the prevailing flavor of the red berries. Other new varieties on trial have not fruited sufficiently to merit notices.

Blackberries.

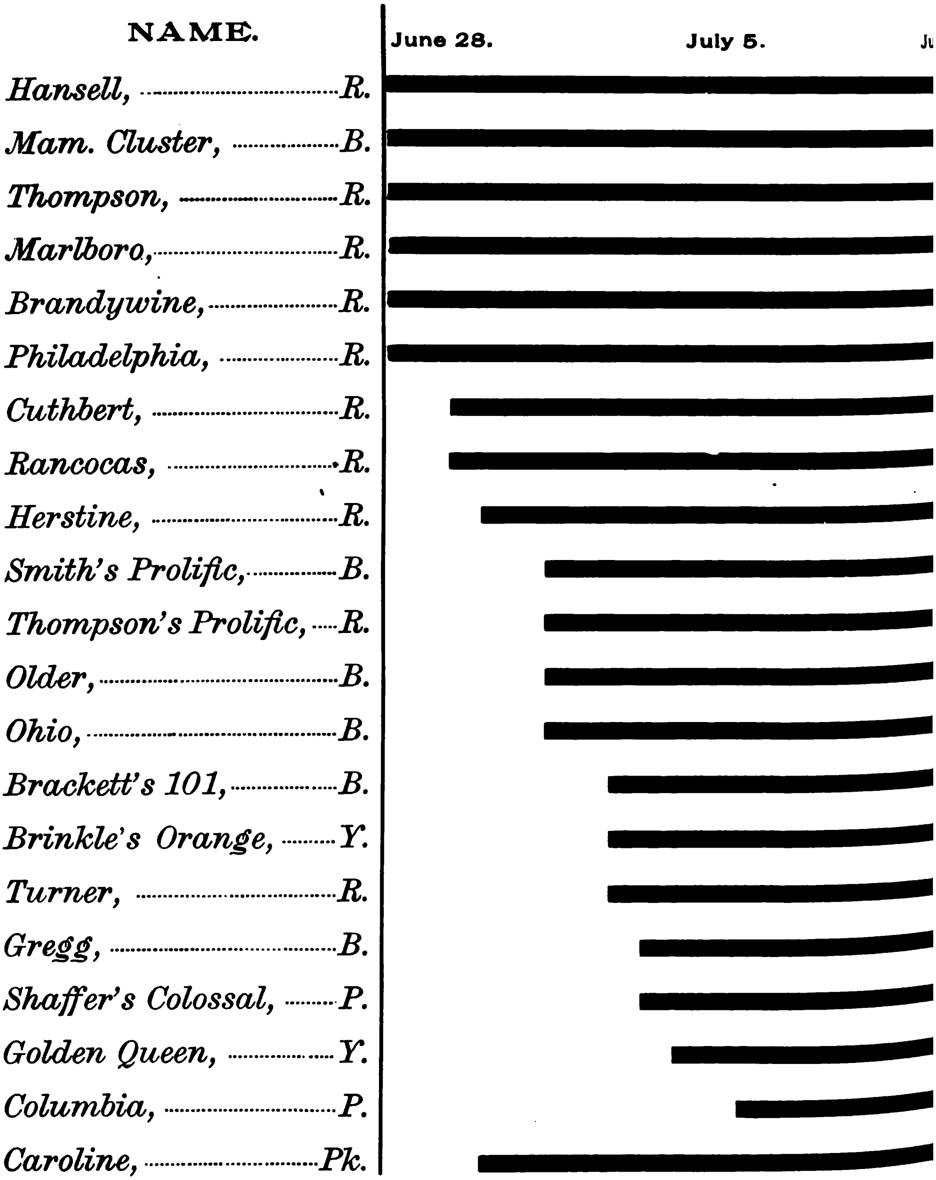
Only a few new blackberries have fruited enough to make a report upon. It is to be remembered that the mere report upon something new should not carry with it the impression that the new is better than the old. A direct comparative test is always necessary to pass a trustworthy judgment upon a variety of any fruit. You are well aware that we cannot compare this year's results of one variety with last year's results of another. Neither can we properly compare the results of one variety in one garden with the results of another variety in a different garden. Therefore, we have always retained a large proportion of standard varieties of fruits in the grounds where we are testing the novelties sent us.

Early Harvest blackberry has regularly been the earliest to ripen with us, and besides yielding heavily it yields through a very long period. The fruit is medium in size, sweet, and quite solid, making it easy to handle for distant markets.

Eldorado is a variety sent us in 1891 from Greenville, Ohio, for trial in this State, and thus far we have found it to be our heaviest bearer. From some recent correspondence concerning it, I apprehend that the entire stock has been sold to a nursery company, who will put it upon the market this coming spring. The berry is black and very sweet; it is medium in size and from round to conical in shape. It ripens

PENNSYLVANIA STATE COLLEGE A

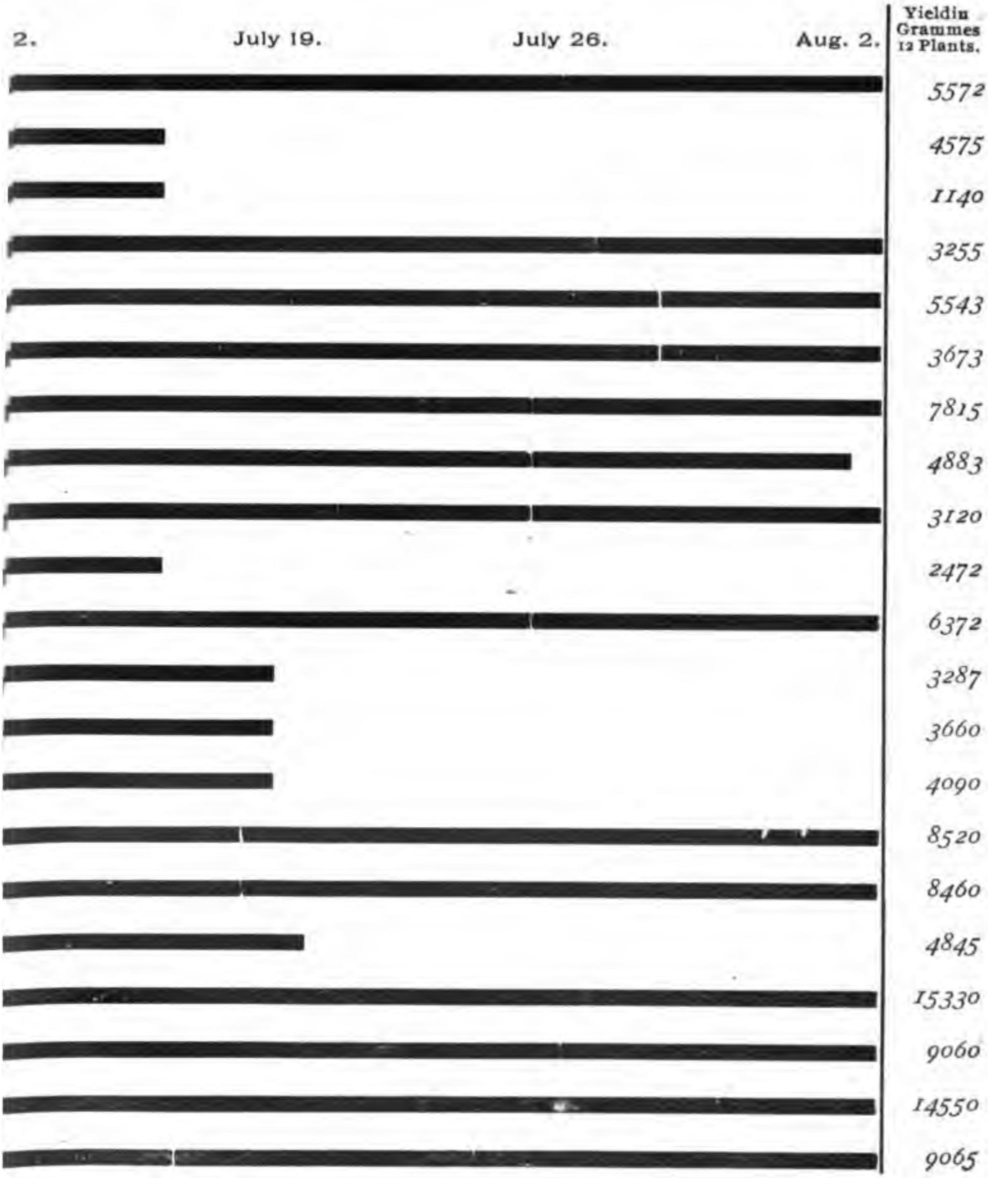
RASPBERRY CHAR



COLOR OF BERRY.

R.—Red.	**P.—Purple.**
B.—Black.	**Pk.—Pink.**

OR CROP OF 1893.



evenly but not very early. The plants are vigorous and hardy, and are not much attacked by rust. We consider this a very commendable berry.

Jewett is a new variety sent us by the Lovett Company, of New Jersey. The plants have shown great hardiness and vigor, the canes are strong and the foliage is vigorous and healthy. The berry is large, round, purplish black and firm, although the single drupes are large and fleshy. The berries do not ripen very evenly and therefore are likely to be picked before fully ripe and often found to be sour. It is a valuable late berry, running late in August.

Snyder is a well tried variety, good for either home or commercial gardens. It yields heavily, but during a more limited period than the preceding one.

Mr. Chase. What is the size of Eldorado compared with Snyder blackberry?

Prof. Butz. It is hardly as large as Snyder. We have not fruited the Japan Wineberry.

Mr. Snavely. A gentleman in Lebanon county finds the Wineberry productive, and salable at market.

PROPER GRADING OF FRUIT, ETC.

By W. B. K. Johnson, Allentown, Pa.

Mr. Chairman, Members of the Pennsylvania Horticultural Society:

I find, to have a proper standard, whereby fruits of all descriptions are to be graded, is not as easily accomplished as it may appear on its surface, except, so far as individuals may grade their own product, but, to have a general grading throughout this Commonwealth, we must have some legislative co-operation, the enforcement of such laws enacted by our legislature. To-day we have men authorized to inspect flour, coal oil, whiskies, etc., placing their official mark on each article inspected; is bought and sold by its grade, as marked upon each case containing the inspected article, while fruit and vegetables used daily in every family within the confines of this State, may, over this whole Western Continent, even to the four quarters of the globe, and as a healthful diet recognized the world over.

Grading fruit is not simply separating the better from the inferior. There is another grading which is pre-eminent, and that is a uniform measure. Our old standard measures of half bushel and peck and others become so old.fashioned that they are a mere figure head with many of our fruit dealers. The per cent. of fruit and vegetables measured by these measures, I fear, is exceedingly small; it has become a custom to use barrels, crates, baskets, berry boxes and others to carry fruit and to ship to distant markets. To do this we have no fault to find. Wherein we do have fault to find is the various sizes.

I will take for an example the basket. There are five-eighths or ten-sixteenths, one-half or eight-sixteenths and seven-sixteenths bushel baskets; each of these sizes is a basket of the original intention. I doubt if any wrong was intended, but, it has opened the doors wide for the perpetration of fraud, the inexperienced in the sizes of baskets thinking a basket means a half a bushel, and when they bring their produce, whether fruit or vegetables, to the dealer, the buyer bargains for at so much a basket. When the bargain is completed the dealer brings his five-eighths or ten-sixteenths bushel basket and wants them filled round full. The farmer figures twenty bushels will fill forty half-bushel baskets, but, when he counts the baskets he only finds thirty-two. A dispute arises, but being sold by the basket and bought by the basket, the farmer takes his pay, but uses his mental arithmetic, and at home his written arithmetic, until he finds out that the baskets he filled must be five-eighths bushel baskets. There is where I lost my four bushels of fruit. Well, the farmer has left the dealer's place; the dealer fills his seven-sixteenths bushel baskets, or fourteen quart baskets, and the farmer's twenty bushels fills forty-five and five-sevenths baskets. He paid for thirty-two baskets, now offers forty-five and five-sevenths baskets, gaining on these twenty bushels thirteen and five sevenths baskets. By buying in five-eighths and selling in seven-sixteenths, such dealers are generally the loudest complainers; there is no money in fruit, why I sell that fruit there at the same price per basket as I paid for it. And, in order to make their, or his, assertion strong and a semblance to truth, is willing to show the bill. For such tricksters we need wise legislation and the co-operation of good, honest merchants, and backed by every horticultural association in the land, that barrels, crates, boxes, etc., are of such sizes that every buyer knows what he gets and every seller knows what he gives. It often surprises me in the sizes of berry boxes returned empty. In the pint and quart boxes it seems that every manufacturer has his own notion about the size, or else, in their calculations, must figure on liquid measure. I do not remember ever having my crate returned, where boxes were mixed from other manufacturers, that they held alike, even some one-sixth less than my quarts, and yet some one sold that box for a quart. We shall now consider the preparation for the market, whether fruit or vegetables, careful picking, careful handling, scrupulously clean baskets and boxes free from last year's mould and stains adds largely to quick sales and better prices. Often one bad, over-ripe berry injures the sale of the box; one bad peach hurts the whole basket; one bruised or brown spotted pear rots the whole basket. Next in order is the grading. I am sorry to say that there is no established schedule in this country. The American Pomological Society has been making wonderful improvements in the cataloguing of fruits, raising the standard of all fruits, and as it is the highest authority on this continent, it will work its way onward until our American fruits will be recognized by quality and protected by the government, and by horticultural associations like this, is bringing its needed reform and protection to their respective legislatures, and when supported by the strong arm of those horticultural associations our legislatures will give heed to their wants and desires. As there is no established schedule, I will give my idea, through observations at home and abroad. I might here remark that the grading of fruit must be two-fold; one for home or nearby markets, another for more distant. For convenience sake I will make three classes and culls, 1st, 2d, 3d and culls. The first class must be the largest, best covered, most perfect matured growth; second should be of a fair size, with only slight defects, which would otherwise bring it into first; third, all wormy, fruit, scabbed, more or less irregular in size and form; culls from such that will not pass for third, and rather better than need be for cider vinegar. One schedule will not answer for apples, pears, peaches, plums, quinces and berries; as the fruit differs so will its schedules, and as the time limit will not permit me to enter them all, I will take one or two, and if there is time, I should like to hear it discussed. As the pear is one of the fruits of which all should know more about it than we do, I will take it first. In order to have first-class fruit we must try and grow it well developed, gathered at its proper time, well colored in the ripening, studying your market, using judgment in the assortment for shipping, or the home market, having the fruit as near alike in ripening as possible which enter the crate, barrel or box; never allow a single pear too highly ripened to get in with those to be shipped, or you may lose your whole box. Always sell your highly ripened pears at home, have your first class, second class and third class, grade them carefully, wrap them in thin paper for that purpose, to keep them from chafing, never use too large crates or boxes; half a bushel is large enough, the sides should be smoothly planed to keep the fruit from being discolored. Then, if properly handled, your fruit will open beautifully and you stand a very fair chance to get remunerative prices. Never ship wormy pears or scabbed pears; sell them at home. Never ship pears with stems broken off if you can avoid it.

Peaches, whenever the season permits, I grade them. Varieties differ in sizes, and so the number of peaches depends on their size to fill a half a bushel basket. When they run very large I grade them 60 to 70, 70 to 80, 80 to 90 or 100, 100 to 150 peaches to the basket. First class means clean, well colored, well grown fruit; then a second class and a third class. Always have your fruit uniform from top to bottom; never put the little, insipid, imperfect fruit at the bottom and top off with a few good peaches, with a sprig on the top. It is not honest, and your brand, whether strictly first class or falsely packed, will soon be known in the market and dealers, reputable dealers, will avoid the topped baskets, as their customers have no use for such fruit if others is to be had.

Apples. I scarcely know how to get at them, as they are mostly sold by the barrel, having one layer at the bottom, another at the head, of fair fruit, while the middle of the barrel is filled with culls and wormy fruit. I once saw a lot of men barreling apples in York State. By the number of barrels the pile must have been a pretty big one. After being all barreled there was probably one and a half barrel of culls left, fit for nothing but hog feed. The barrels were all marked selected. To ship such apples on the English market would have been a ruinous business, for there the fruit must be uniform, well colored, and I have heard it remarked that three wormy apples would have condemned the whole barrel. Good apples always command a fair price, whether at home or abroad. The continent mostly prefers red apples, as well as the English islands; in America Boston for green, New York all sorts, Chicago red, and thus each locality differs somewhat in color and flavor. As only those who made apple culture a study, and of course, a business to grow, or observe their growing, can know how much they will feel the tender touch of man's kind and proper treatment, and under such treatment we have such a controlling power that we have it almost at our command, whether we shall have poor, scrubby fruit, scabby, wormy, or fine, well grown, well colored, delicious fruit, such as the ancients would have offered to their gods.

In conclusion, I will say that graded fruit or vegetables is noticed by princes and peasants, and if the peasant knows how to grade it the prince is ready to buy, and why is it? Because its nice, catches the eye. In many instances it may not be the quality as much as the care in putting it up for market; in others again the better grower, best colored, free from blemishes is the best and most highly flavored fruit, and its merit commands the better prices.

The Citrus Fruit. There is no better graded fruit in the world than Florida and California oranges. And what brought this fine grading about? About a dozen years ago there were some packing houses established along the St. John's river. As they were constantly buying they were able to grade, and wrap their fruit, until it became an established business throughout the State. I well know when orange shipping from Florida to Savannah and Charleston first took place. The grading of the orange has taught shippers all over the country a lesson, until California ships its fine plums, apricots, peaches, pears and many other fruits, so that California fruit is almost as common on our fruit stand venders as our own. I predict that Pennsylvania, having the soil, the climate to grow any fruit that can be grown anywhere on this same latitude, with a finer and richer flavor than almost any other State on this continent, will in the near future be one of the great fruit gardens of America. We have the soil to grow giants of apple trees of such sizes and dimensions that no other State can equal, likewise the pear, the peach, the cherry, the quince and others, but as the grand old Keystone has been yielding so richly in cereals, no attention has been given to fruits, but railroads having its branches and feeders all over the west, bringing its grain to eastern markets at ruinous prices, our farmers are looking in other directions to make their bread and pay their taxes.

The Secretary. Some of you no doubt remember that at our meeting last winter, Mr. Cooper stated that he had made some experiments with peach yellows, and believed he had found a remedy. He declined to state what the remedy was or to give any particulars, but promised in case his experiments were successful another season, to give the results at this meeting. He is not able to be present in person, but has sent the following paper upon the subject which, if in order, I will read:

Experiments on Peach Yellows.

Mr. President and Members of Pennsylvania State Horticultural Association:

I regret exceedingly that my fate seems to have ruled that I cannot meet with you as usual. But urgent calls from members of the board of agriculture finds me this week in one of the most northern counties of the State, working in the interest of agriculture and horticulture. And while my heart is with you in the latter, duty dictates that I should work in another field at this time. Your secretary wrote me some time since that I was booked for some results with Peach Yellows.

About three years since in examining a few trees stricken with that malady I observed the bark seemed to be exceedingly dry and in an unnatural condition, and although the time was when they should be in vigorous growth, the bark seemed hard and lifeless. I tried three experiments by cutting through the outer coating and waited results, in a few days there was quite an opening, as far as the cutting had been made; I badly damaged one of the trees by cutting too deep, which died during the following winter. About same time the cutting was done, I applied a weak solution of caustic soda, to about ½ dozen trees all more or less affected, including the 3 trees that had been scored from the surface of ground as high as I could reach. The result was in about 2 weeks a great improvement, and foliage apparently changing from their 'yellow caste to a more natural color.

Each year since the first treatment was applied, I have twice or thrice given the trees a thorough wetting on the trunks and branches, as far out as possible, without injuring the foliage, as the solution used would kill all foliage and grass under the trees, as well as cut holes in clothing, and the skin of the operator if it fell upon him. It is therefore necessary to use the greatest caution in applying. The substance used was caustic soda, 75 per cent. pure oxide of sodium, one pound dissolved in 2 gallons water. For old trees I find this seems to very materially assist them to resist the effect of the disease. But for young trees, it is too strong for the tender bark, and shall in future use for them, double the quantity of water, or 4 gallons water to 1 pound of caustic soda.

I am not sanguine that this will be a cure, but I have found the trees that were badly affected are yet in fair growing condition and last year gave us some nice naturally ripened fruit. I therefore hope other members of the association will take up the matter and continue experiments, and if posible discover some remedy for this great obstacle to successful peach growing.

Hoping your meeting may result in disseminating much useful information, and regretting I cannot this year enjoy the social feas(, I am most truly your co-worker in horticulture.

CALVIN COOPER.

Prof. Heiges. On the day after the Farmer's Institute at Black Barren Springs, I stopped at Mr. Cooper's place and inspected his peach trees. Although treated as he claims I still found indications of yellows, and further time will decide whether his remedy will be effectual. I saw while there, a result of spraying apple trees which would convince the most skeptical. He has a row of four Baldwin trees, the end trees being covered with healthy foliage and ladened with fruit, while on the two middle trees the fruit was on the ground. Any one seeing it would have become a convert to the importance of spraying. I want to say also that it is possible to spray apricot, peach and almond trees, but we must use double the quantity of water that is used in the Bordeaux mixture, and we can spray those fruits with no danger of injury to the foliage. Let me warn you however against the use of London Purple. It is a by-product and there is no certainty as to its strength. The only way to ascertain is by testing it. We know what Paris Green is and it is always safer to use it for spraying.

Mr. Johnson. I want to corroborate what Prof. Heiges has aid in reference to the value of spraying. I experimented by spraying ½ of a crab apple tree and that part was loaded with fruit, fine and large. The next year the other side bore, and now the tree bears every year on alternate sides. I am also convinced that, as Prof. Heiges stated, there is no certainty as to the strength of London Purple.

I wish to say in reference to peach yellows, that the subject has been discussed in almost every form imaginable for many years. It first appeared in 1801 around Philadelphia and Baltimore. For my own part I do not choose to say much as to the cause and remedy, but, take a seed from a poor sickly grown tree, or an insipid, imperfectly ripened peach bud, the tree, set in a soil not suitable, or worn out, and the poor tree stands a very favorable chance of taking the yellows. Root lice may attack better trees and in better soil, when not properly cared for, or when they are prevalent in the surrounding soil.

Prof. Smith has expresed my views very clearly, believing when better known, that we have less of yellows, and more of root lice. Then when only trees are planted grown from healthy seed, in suitable soil for peach culture, or using fertilizers necessary for a healthy growth, we have still less of yellows. The views of Prof. Smith, to which I have referred are found in the 18th annual report of New Jersey State Board of Agriculture, 1890-91, page 93, and are as follows:

"I want to say a few words before proceeding to my paper. I was before out State Horticultural Society a few weeks ago, and made a statement there in reference to the existence of peach yellows which I desire to modify. I did not know the statistics in regard to yellows in New Jersey then. I have learned them since; but at the same time I do still insist that a great deal of what has been called yellows in the State of New Jersey has nothing whatever to do with this fungus disease, or whatever it is, called "yellows" in other portions of the country. A great deal of the yellows and sickly appearance that is shown by the peach trees in southern New Jersey especially, is due to the attack of the root lice, which can be cured by the proper application of either kainit or tobacco, and preferably tobacco. This has been found effectual in Delaware, and I have found it so myself on the leaf form, and growers have confirmed the effect on the root form. A good deal of the 'yellows' so called in this State, is simply due to the poor character of the ground upon which the trees are planted. I have heard, since I have made that statement before the Horticultural Society, considerable criticism of it by peach growers; men who I admit, know a great deal more about the subject than I do. I have some reason to believe now there are some 'yellows' in New Jersey, but I believe, not to the extent to which it was generally supposed. I think we have a great deal less of it than some of the other states that will not acknowledge it."

Mr. Engle. I believe as Mr. Johnson says, that some think they have yellows when they do not. One infallible sign of the disease is the premature ripening of fruit on one or more branches two or three weeks in advance of the regular season. If we have a tree of this kind no matter how thrifty in appearance, we should dig it out at once. I have a peach tree in my orchard that has been bearing a number of years, upon which one branch ripens later than the rest of the tree. Mr. Hale says it is a symptom of yellows same as premature ripening. I have taken buds from it and put them on another tree and will see whether it will develope further.

Mr. Heiges. I am as much interested in the introduction of choice winter apples and fruits of all kinds as any one, and in the efforts to produce the same from seedlings, but I believe good fruits can be more surely obtained by cross-fertilization or pollination than by depending on chance seedlings.

It is accepted as a principle most generally true in the animal kingdom that the male parent influences the external structure of the progeny whilst the female parent exerts the greater influence upon the internal organism of the progeny.

Intelligent breeders of domestic animals, therefore, carefully select stock for breeding purposes with this in view. A male Jersey formerly owned by Thomas Harvey so impressed his progeny that they could be recognized anywhere in Chester county, regardless of the breed of the female parent.

In the vegetable kingdom plants have organs corresponding to the male and female in the animal kingdom. These are sometimes found in the same flower, sometimes on different flowers on the same plant and sometimes each is found separately on flowers of different plants.

The pistils of the flower correspond to the female and the stamens to the male of the animal kingdom.

Fertilization is effected by the pollen of the stamens coming in contract, by various means, with the stigma of the pistil.

When cross-fertilization is effected, that is by the pollen of one variety coming in contract with the stigma of another, most generally the pollen modifies the external form and the pistil thus fertilized gives rise to the internal structure or quality. Florists, by selecting a weaker plant for the pistillate have produced most startling effects in crosses. Here is a wide field of investigation for our younger members who are interested in the production of new varieties of fruits and vegetables.

In pursuing this work I would suggest that they select as the female parent a variety of the best quality, and for the male, one of good form and size and appearance.

A Member. Will. Prof. Heiges explain the method of procedure in hybridization and cross-fertilization or pollination of varieties?

Prof. Heiges. All may not know that the stamens of the blossoms to be cross-fertilized must be removed at a very early period of the blossoming, before the pollen has reached maturity or the stigma will be self-fertilized, that is, by pollen of its own flower.

The blossoms should be tied up in blotting paper so that pollen from other blossoms may not fall upon the stigmas or be carried by insects or wind. When the pollen granules can be easily lifted from the stamens of the variety to be used, by means of a small camel-hair brush, place them upon the stigma of the emasculated blossoms, tie over with paper again, and if the operation has been carefully performed the matured seed or fruit will be a true cross. From these seeds new varieties will be produced.

Do not expect all fruits produced from these seeds to be improvements on the parents. Nature loves variety. Many will be worse than either parent, but if you have produced one better you have achieved a great victory.

In my experiments in cross-fertilizing the potato, I used the Snowflake as the pistillate parent, selecting this variety on account of its superior quality. Its weak point was the production of too many small potatoes and too few of marketable size.

It appeared to lack the vitality necessary to develop to a good size all the potatoes it set.

I used the Mammoth Pearl as the staminate parent, selecting this variety for its uniformly large size and good shape.

The progeny of this cross produced from the seed-boll was of almost every form and color.

I selected those most closely resembling my ideal potato and by successive planting and selecting obtained a variety of the quality of the Snowflake and of the size of the Mammoth Pearl, producing fewer tubers than the former, but more than the latter.

Those who have tried this variety know whether or not I have accomplished the end aimed at; a variety of superior quality, good form and size and great productiveness.

In answer to question 27, "Will Japan plums prove an acquisition," the secretary read the following from Ex-Pomologist Van Deman:

Japanese Plums in America.

About twenty-five years ago a Mr. Hough of Vacaville, California, received from Japan a variety of plum which has been the forerunner of a host which in themselves are a blessing to this country, and their progeny is likely to be of untold value. This was the variety known in Japan as "Hattan" and here as "Kelsey," Mr. Hough soon died, but not before he had sold the entire stock to Mr. John Kelsey of Berkeley, California, who was an enthusiastic experimenter with fruits. Mr. Kelsey left the trees in the nursery row until they began to produce fruit, which was as early as 1876, for in that year he showed specimens to Prof. E. W. Hilgard of that State, and again the next year to others.

As we now know, in most parts of this country, this variety is not so hardy or of so great value to us as those that were imported afterwards. It is true that the fruit is large, of good flavor and ships well, because of its firm flesh, but the tree is quite as tender as the more hardy kinds of the fig; it blooms very early and is, therefore, subject to destruction by frost and the fruit does not ripen evenly. The latter trait is not objectionable for home use, but a decided disadvantage for market purposes. I have within the past few years seen boxes of this plum in the Eastern markets sent from California and the Gulf States that averages fully three inches in their longest diameter. The fruit is of a greenish yellow color, tinted with purple, and distinctly bean shaped. There have been occasional reports of this variety being hardy as far north as Iowa and New York, but in every such case of which I have heard, close investigation proved that the trees were those of some other and hardier variety. I have here and there seen a tree struggling against the elements as far north as New Jersey, but with only partial success. For Pennsylvania I should say, let the Kelsey plum alone.

But soon after the introduction of the Kelsey's other and much more hardy kinds were brought from Japan to California, and thence to every state and territory. Mr. A. D. Pryal and James Shinn of California, were the first so far as I have heard, who planted collections of these kinds in America. Each had a number of varieties different from Kelsey and from each other. They were more nearly round, smaller, and varied in color from clear yellow to blood-red. Some of these are generally cultivated, not only for family use but for market.

Mr. Luther Burbank of Santa Rosa, Cal., also imported Japanese plums and among a lot of seedlings he raised in 1885 was one which when it came to bear, proved of such good qualities, that it was thought worthy of a name and general trial. Therefore, it was called Burbank, and up to this time it stands at the head of Japanese plums in America, as does Mr. Burbank as a horticultural experimenter.

But the greatest good that we shall perhaps get from the introduction of Japanese plums, lies in the crosses with our natural species and possibly with Prunus Domestica also.

This work has been started and already there are new varieties of such origin. It may be true, as a few leading minds have long ago suggested, that the plums of Japan are of very near kin to our own. Dr. C. N. Dennis of Cedar Rapids, Iowa, has recently published statements to this effect and there are physiological reasons for believing that he is correct. The wood, leaves and seeds of the Japanese species are much more like those of our Prunus Americana, P. Chicasa, etc., than are those of Prunus Domestica. It has long been thought that the floras of this continent and Asia were in bygone ages divided by the submergence of the land now under the sea, that lies between their northern borders, or at least, that many of the species had common origin. Be this as it may, it is now a demonstrated fact that the Japanese plums and our own will readily cross and they have already produced some remarkable varieties. Any one who will examine that unique and thoroughly scientific catalogue of Luther Burbank's entitled "New Creations," will be convinced that he has not been idle. Having visited his grounds at Santa Rosa, Cal., some years ago, and having since examined many of his choicest specimens up to the past year, I can bear personal testimony to the value of fruits of his labors. It is too early to be able to know how these "new creations" will stand the test of other environments than those at their place of origin, but it would be safe to predict that some of them will remain to bless the future generations. And yet the work of experimentation on this line is only begun. What the future may unfold to others, if not to us, in the way of new plums, to say nothing of other fruits, should awaken our liveliest hopes.

There are a host of interested pomologists at work testing if not originating varieties of this new race of plums, and it would seem reasonable that the fruit growers of Pennsylvania should not be behind the times. It is certain that a large part of them are suited to the conditions of that state and of nearly all the states.

I see by the programme of your next meeting sent me by Secretary Engle, that the question is asked "Will Japanese plums prove an acquisition?" to which this answer may be made with safety, "They are at least worthy of a thorough trial."

H. E. VANDEMAN.

Parksley, Va., January 8, 1894.

Mr. Chase. I can endorse every word Mr. Van Deman has written. I have seen considerable of the Japan plums during the past five or six years and have fruited several varieties. While they may be of great use for hybridizing or crossing with our native varieties, they are in themselves a marked advance on our present race of plums, in vigor and health, and are well worthy a trial. I have fruited Burband and am greatly pleased with it. Sorry I have not 2,500 trees planted instead of 25. It is hardy at Geneva, N. Y., and has stood 22 degrees in Monroe county in this State without injury. Abundance is also good. Satsuma I have not yet fruited. Burbank is a course grower, both in nursery and orchard. "True Sweet Botan" and Abundance are the same. None of these plums are as high in quality as Coe's Golden or Green Gage, or the best plums we now have, but are equal in quality to our common varieties, such as Lombard. They are not by any means perfect, but a decided acquisition, and will likely be the forerunners of a new race of plums that will be indispensable for general cultivation. Many that have been imported are simply seedlings and there is as yet considerable confusion as to names and varieties.

Mr. Brinton. I want to corroborate what Mr. Chase has said, and I consider the Japan plums well worthy of introduction. They are vigorous growers, abundant bearers, and do well on peach roots. In the language of the day, "They are a good thing."

Experience With Fertilizers.

The following was read by E. C. Brinser, Middletown, Pa.:

The fertilizer question is one that confronts the majority of fruit growers in various ways. The question arises is it really true that fertilizer in some form is cheaper and better than farm-yard maure? How and when shall it be applied? How and where obtained, etc.? From reading the agricultural press we find that many fruit growers agree on this point, viz: That it makes more and better fruit, finer colored and finer flavored. Are these facts obtained by experience or otherwise and if so at what comparative cost? These and many other questions suggest themselves to the mind of the progressive fruit grower. My knowledge and experience is far too limited to argue this question before this association. I merely throw out these suggestions for discussion and trust the subject may be so discussed by the intelligent part of this association that we go home better fitted for our respective vocations. If farm yard manure was as good as convenient and as cheap as a prepared fertilizer we are all aware it would be next to impossible to obtain a supply for the purpose. Therefore it seems evident we must resort to concentrated manures. Feeling and knowing this we need to know what to apply to each and every kind of fruit. What is best for one may not be best for another and so on. Knowing all these facts (and they staring us in the face) we are ofttimes unable financially to obtain an adequate supply. To know how to get the most for our money and how to apply the most judiciously for our money are very valuable points. These I refer to you for discussion. I will cite a few instances as my experience and I am done. My earliest experience has shown me that I applied too little for much benefit. Later on I began to use it heavier with better results. My bearing peach orchard six years old has given me three successive crops of very fine peaches. The most of the trees are fine and healthy yet. The orchard was farmed to potatoes, Sweet and Irish for three years. Since then I applied wood ashes and raw bone. There is quite a contrast between this orchard and another alongside of mine which was not so highly fed. It also bore well, but the trees are not near so thrifty. Just last season I harvested about 175 bushels strawberries on 1¾ acres of fine fruit and no rain through the strawberry season except a light shower at the close of the season. This ground was fertilized with barn yard manure and considerable fertilizer for a few years previous. On a row of raspberries planted last spring upon which was applied fertilizer the growth was about double as much as in a row where none was applied. My experience all along has been that when I applied fertilizer it was followed with good results. These are but a few facts which I might quote, but let these suffice. I am satisfied that fertilizing pays, but just how and when to apply I will not attempt to specify. The great and all important point with me is how to get it for the least money, as we are all aware that it is expensive to say the least. If this association can enlighten me on this subject that I and we are verily benefited I shall have gained the mission of this short paper.

Mr. Pierce. I want to say that I would not plant potatoes in a young peach orchard. Always prefer to grow corn.

Mr. Bartram. I planted a peach orchard of 10 acres a few years ago, nine acres of which were cropped with potatoes and one acre with corn, and the portion planted to potatoes made much the better growth.

Mr. Heister. This is a very important subject, and one of dollars and cents. In the cultivation of any crop, if we take from the soil its fertilizing element we must return it. We find potatoes one of the best crops for a young peach orchard the first two years after planting. Strawberries are also an excellent crop. We usually manure these crops heavily and the peach trees make a much better growth for the extra fertilizers and frequent cultivation which they receive.

Mr. Pierce. Where I come from it is the custom to apply the manure to corn, not to the potato crop.

Mr. Bartram. I use considerable both of fertilizer and stable manure, I pay about $200 per year for stable manure and haul it nearly four miles. I also use considerable commercial fertilizer, more particularly bone. One of my acquaintances in New Jersey is substituting commercial fertilizers quite largely for stable manure, but I am hardly ready yet to discard the latter entirely. However, the question of labor enters into this matter so strongly that I am almost ready sometimes to quit the use of stable manure entirely. Quite a good deal of the manure I use goes on my asparagus beds. For a young orchard I prefer to grow root crops much better than grain, so long as I cultivate it. Have never manured my peach trees much after done growing crops. I manure my young apple trees after the peaches have been taken out.

Mr. Engle. We almost invariably prepare our young peach orchards first year for corn and next for potatoes. The test comes when the trees come into bearing. Then we can hardly fertilize too freely. No fruit is more exhaustive than the peach. The seeds especially draw heavily on the soil.

What is the Proper Age of Trees for Orchard Planting?

The secretary read the following letters in reply to the above question:

Glenburn, Pa., January 4, 1893.

Secretary E. B. Engle.

Dear Sir: I will say in reply to question No. 23, that in my judgment thrifty trees two years old are the most suitable to set. They will make the most satisfactory advancement, and be the most reilable.

Yours,
H. W. NORTHUP.

Walnutport, Pa, January, 1894.

"Dear Sir: For general planting, I have had the best results from apples, pears, plums and cherries, with three year old trees, and peach trees one year old.

W. M. BENNINGER."

Mr. Johnson. There is not so much difference as to age if roots are in good condition. For cherries two years is about the proper age, and peaches one year from bud.

Mr. Brinton. Much depends on the health and vigor of the trees, and they should be protected the first season after planting from the direct heat of the summer sun. Unless protected in some manner the trunk is apt to scald.

Is Thinning Fruit Advisable and Profitable?

The following replies were read:

"In reply to question 24, I think it is always profitable not to have the fruit too thickly set upon the tree. There are two ways of overcoming this difficulty. The first is, by previously pruning sufficiently; and the second is by removing the small fruit. If the trees are small the latter may be done, but if large, it is too tedious."

H. W. NORTHUP.

"I have had very little occasion to thin fruit, the great trouble is, they do not bear enough. My opinion is that the best time to thin fruit, is when assorting, while on some varieties it would probably be profitable in order to mature fine specimens, but in order to thin profitably it should be done by one who has experience, and the thinning would probably be more profitable when the indications are for an over-production, and when only fine specimens will bring good prices."

W. M. BENNINGER.

"Cornell University,
Ithaca, N. Y., January 4, 1894.

E. B. Engle.

Dear Sir: I am sorry to be obliged to tell you that I have not as yet carried on any accurate experiments regarding the thinning of fruit in orchards. I have the subject down for investigation and I hope to be able to give some definite results next year. All my observation leads me to believe that by thinning fruit, the size of that remaining on the tree is increased more or less. This refers I think particularly to apples, pears, peaches, plums and grapes. I would hesitate to say to what extent the thinning of other fruits, and especially small fruits, affects the size of that which is marketed. It seems to me that the extent to which thinning can be carried on profitably is a matter which should be largely determined by the individual growers. I have seen growers of apples sell fruit of extra quality at prices which were paid for inferior grades. I do not believe it would pay him to thin fruit, although the result of much thinning might be very marked. If the grower is a good business man and has a good market, thinning fruit would yield rich returns, but I imagine in many cases it would turn out to be a losing business.

E. G. LODEMAN.

Mr. Brinton. I think thinning is always profitable if judiciously done.

Mr. Pierce. I am surprised to hear anyone say there is any doubt as to the profits of thinning. In peaches and plums the pits take nearly all the mineral elements that are supplied by the soil and if we can reduce three pits into one we will save that much. Large fruit pays so much better, and requires less handling. I have sold Astrachan apples at 70 cents per half bushel basket, when others could not sell theirs at 10 cents. The yield in bushels is about the same and the price will usually average two or three times as much.

Mr. Johnson. It does not take longer to thin, than to pick when ripe, and the value of those remaining is always greatly increased.

Mr. Engle. I have often thinned peaches and other kinds of fruit, and while at the time I was certain I picked off enough, I do not believe I have ever taken off as many as I should.

Mr. Pierce. Another good way is by disbudding. Cherries, plums and pears can readily be thinned in that way. It can be done before the foliage is on the trees.

Is There Danger of Over-Production and Permanent Low Prices for Fruit?

The following was read by the secretary:

"I do not think there is any danger of over-production and low prices, as a general rule if the proper efforts are made to find a market and educate the people to use more fruit. I am of the opinion that low prices are generally caused by the fruit reaching the consumer in poor condition. I also find that the retailers in most of the small towns, especially in the coal regions, are asking too big profits."

W. M. BENNINGER.

Mr. Johnson. For the following figures in reference to the extensive apple orchards of Mr. F. Wellhouse, Fairmount, Kansas, I am indebted to the report of the American Pomological Society. The plantings of Mr. Wellbourne were, in 1876, 117 acres; in 1878, 160 acres; in 1879, 160 acres; a total of 437 acres. Up to the spring of 1891, from eleven crops he had gathered, 239,185 bushels, which had sold for $125,118.08. Total cost of putting into market, $44,737.30, leaving a net profit, except rent of land, of $80,380.78. The crop of 1891 promised to be equal to that of 1890, which was 79,170 bushels. The varieties are, Ben Davis, 225 acres; Missouri Pippin, 70 acres; Winesap, 70 acres; Jonathan, 40 acres; Cooper's Early, 16 acres; Maiden's Blush, 16 acres. The investment has been sufficiently encouraging for him to plant more, for in 1891 he had a total of 800 acres planted.

Are Co-operative Associations Advisable for the Shipping and Marketing of Fruits?

The following reply was read by the Secretary:

"I am convinced, and have always advocated that co-operative associations would be desirable. I know they have worked well in a number of the southern states. There are too many dishonest and careless commission men. Good co-operative associations in different sections of the State, with a good live agent or agents for each association, could in the first place prevent glutting the market, and save the extra commission and freight rate, for instance, of shipping to Philadelphia then back to the coal regions, as they could establish markets more direct with the consumers. Such co-operators could also establish markets and educate the people to use more fruit in the smaller towns, and where fruit is scarce. I believe that this association and fruit growers in general could do no better work than to educate the miners and laboring people to use more fruit and less beer, whiskey and pork. This could easily be done by having fruit agents to push the sales in the various coal mining towns on pay day. This could all be done by co-operation."

W. M. BENNINGER.

Mr. Johnson. A few weeks ago I attended as a delegate, a meeting of farmers in Savannah, Georgia. The question was discussed there and all were in favor of co-operation, and getting rid of the class of middle men referred to in the paper just read.

The following questions from the query box were read and briefly discussed:

"What forest trees are most profitable to grow, and should they have a place on the farm?"

Mr. Brinton. That depends upon circumstances. If for fire wood I would say Ailanthus. If for general purposes, black walnut, or where for fence posts, yellow locust.

Mr. Pierce. Black walnut is a very slow grower. There are trees planted by a schoolmate one-half mile from where I live, 51 years ago, and not large enough for a good saw log yet. Unless you grow them with long stems they are not of much profit.

Mr. Brinton. I beg leave to differ with the gentleman. A medium sized log is generally more solid and of better color than a large one.

Has any one present had any experience with the Evergreen or Everbearing blackberry?

Mr. Rupp. I had it and was very glad to get rid of it.

"What kind of trees are preferable for highway planting, deciduous, fruit, or nut?"

Prof. Heiges. I ould consider Locust one of the best and most profitable, where not attacked by the borer. The taking of fruit is not the greatest objection to the planting of fruit trees along the streets or highways. The throwing of stones and the breaking of branches to secure the fruit or nuts are more annoying in my opinion.

Mr. Rush. I have had much trouble with the locust borer, but when the trees are once established I can grow them successfully by cutting them down and raising the sprouts or shoots.

Mr. Wood. I would suggest sugar maple as one of the best trees for street planting.

"What is the best Peach Fertilizer?"

Mr. Snavely. Raw animal bone and muriate of potash.

Mr. Johnson. Did you ever try common salt with bone?

Mr. Snavely. Commercial muriate of potash contains about 50 to 52 per cent. potash. The balance is chiefly salt.

Mr. Rush. I have used during the past few years, South Carolina Rock and Kainit with good success.

Mr. Scheidy. I would use potash and phosphorus, and crop the first year with potatoes, and the second with sugar corn.

Mr. Brinser. I usually crop my peach orchard the first three years after planting, as I cannot spare the ground for trees alone.

Mr. Brinton. I think Mr. Brinser has struck the key note. Ironstone soil is the best for peaches or cherries. I believe in the idea of special soils for special crops.

Mr. Pierce. What is meant by Ironstone soil?

Mr. Brinton. It is a soil with a deposit of Hematite ore.

Prof. Heiges. On October 24th and 25th last, while attending a Farmer's Institute in McConnellsburg, Fulton county, Secretary Edge and myself saw an exhibit of apples all of which were very highly colored. There were York Imperials that we knew only by their shape. We learned upon inquiry that the soil on which they grew was charged with Hematite ore.

The following was offered by Mr. Snavely and unanimously adopted:

Resolved, 'That a vote of thanks be extended to Prof. S. B. Heiges, for the interest he has always taken in this association, and the valuable information he has so frequently imparted, and further, that the best wishes of this association go with him to his new work as Pomologist of the United States Department of Agriculture.

Prof. Heiges. I most heartily thank this society for the resolutions just read and adopted. I have been with you for 32 years and have tried to do my best for the good of this association. I hope to have your support and assistance in the new field into which I have just entered.

For want of time the following paper was not read. On motion of Mr. Fox the secretary was authorized to publish it with his annual report:

THE CULTURE OF CHRYSANTHEMUMS.

By R. W. Wynnings, Lebanon, Pa.

The propagation of chrysanthemums by cuttings is the system adopted in every country in which they are grown. New varieties and the single sorts are propagated from seed. Chrysanthemum cuttings root so freely that few growers give the subject the attention it deserves. In most cases the cuttings are taken with little regard to quality, and planted where they will root most quickly, with the least amount of trouble. This method of course may serve the purpose where the finest chrysanthemums are not expected; but in order to obtain the best possible results, strict attention must be paid to every detail of their culture. It is of the first importance that we commence operations with good material, that as perfectly a foundation as possible may be laid for future success. It is possible to produce flowers of the finest quality upon plants that are propagated at any time from December to May; but as a rule the cuttings started in February and March give the finest results. Many growers imagine that in a place suitable for propagation, bottom heat is required; but in reality there is no occasion for it, and those who would be successful should take care that no artificial heat in any form is applied, except when absolutely necessary during unusually cold spells. Plants raised in bottom heat rarely produce flowers of fine quality; while it hastens the process of rooting, the plants are always weak and liable to receive injury where those more hardily reared would remain unharmed. A place where a temperature of 45 degrees can be maintained and is kept rather close, with the cuttings near the glass, is most suitable. If but a limited number are required, the cuttings may be inserted in pots, either singly or otherwise, and placed on a firm, moist surface, such as sand or ashes; but if larger quantities are desired, an ordinary propagating bed of clear gritty sand must be resorted to, and the same process followed as for rose and carnation propagating, excepting only the heat. Firm and healthy, short jointed shoots should be selected for cuttings from plants in good growing condition. Those of a succulent nature do not make the best cuttings, neither do those that have become hard and woody, and growths that have the appearance of flowering shoots should also be avoided, although they will root and make plants on a pinch. The cutting should be at least three inches long, and cut with a sharp knife just below the joint. The leaf at the base may be removed and all the rest retained, if the cuttings are to be inserted singly in small pots. If, however, the cuttings are to be put into any ordinary propagating bed, in addition to the removal of the lower leaf, all the remainder may be trimmed, so that the cuttings can be put close together in the bed and the air circulate more freely through them and prevent them from damping off. The small pots that are to receive the cuttings should be filled with a fine mixture of equal parts of sand, leaf mold and loam, well drained, with a thin layer of sand on top. With a pointed stick make a hole in the center, insert the cutting about half its length, and press the soil about it firmly, taking care that the cutting is not bruised or injured during the operation. By this method of propagating singly in pots, the greatest success may be expected, and we would recommend that all specimen and exhibition plants should be rooted in this manner, the extra labor being amply repaid by larger and finer blooms. Where several cuttings are put into a pot, or where rooted in the propagating bed, when the time comes for their separation and potting, the roots must receive some injury and all checks of this sort must be avoided as far as possible, especially for exhibition plants. When the desired number of cuttings is potted water thoroughly and then place in the house or frame prepared for their reception. Here they should be kept close and syringed lightly when dry until rooted, which will usually be indicated by their putting forth new leaves. When air may be admitted gradually on every favorable occasion and they will also need more water. When the pots are filled with roots they should be shifted into larger pots, in a good compost of finely prepared soil. If the cutting has been placed in the sand of the propagating house, the skillful grower can tell by their fresh and plump appearance when they are rooted, without lifting one from the bed. When rooted in this manner they should be potted in about two and one-half inch pots in a mixture of finely pulverized soil. But as they will soon out-grow these pots, the soil for the first potting seldom receives much attention. When potted, if the weather is bright they should be shaded for a few days and kept slightly sprinkled until they start into vigorous growth.

Propagation by seed together with the process of hybridizing is a branch of chrysanthemum culture to which no hard and fast rule can be applied. All seed bearing plants should be grown in pots, small plants being selected, as they are more easily handled. Select the finest bloom and remove the others. The plants when in bloom should be kept in a dry airy green-house or put where they will get plenty of sunlight. If plants are well established and somewhat pot bound they will bea r seed more freely. Select the finest flowers and remove all others and when in full bloom clip off the flower leaves with a pair of shears; but not so short as to touch the stamens or pistils. The plants to be crossed should then be kept close together, rather dry and with plenty of light and air, thus providing favorable conditions for wind and insects to assist in pollinating the flowers, as well as for the use of the camel's hair brush in artificial pollination. In bright sunny weather where bees and other flower hunting insects abound, a good crop of seed may be had by their assistance, but notwithstanding the time and labor required it is advisable to pollinate the flowers by hand using a fine brush in the forenoon or bright sunny days. Mr. T. H. Spaulding of "Orange, N. J.," who has been very successful, describes his methods as follows: "I take the pollen from one bloom on a pointed match or quill of a feather and place a little in each petal of the flower to be pollenated or touch the stamens with it, this I repeat during several successive days at leisure hours. I think the best plan is to take a red, yellow or white and cross it with another of the same color but better in constitution or some other quality. I also believe that the petals farthest from the centre are likely to produce the best and most double blooms. After the pollen is set I withhold water, giving only enough to keep the plants alive and remove them to a dry place to ripen their seed. When the plant is nearly matured the seed will in most cases ripen even if cut from the stalk. Chrysanthemum seeds germinate freely in from seven to nine days when sown in pots or boxes and placed in a temperature of 60 degrees, and if sown in spring will produce blooming plants in the fall. When sufficiently advanced pot the plants singly in two and one-half inch pots and move to larger pots as their growth demands it. A six inch pot is quite large enough to bloom a seedling in the first year. The treatment of seedling plants differs from the treatment of those from cuttings as no pinching or care need be exercised as to the shape of the plant.

Mr. Salter used to say that for every chrysanthemum he named and sent out he destroyed at least two thousand, this may be discouraging to the amatuer, but the truth must be told, yet sometimes a good variety will appear among a few dozen seedlings that may make the grower's name famous. The chrysanthemum being so freely propagated by cuttings, hybridizing and growing of seedlings are only necessary when improvement in either size, form or color is sought for. This ends their propagation, but chrysanthemums do not end here, nor is the hard labor over. To bring chrysanthemums to bloom creditable to the grower, great care must be taken from now on. The cheapest way and quickest is to plant them in the open ground, and lift in fall and pot in their blooming pots. But for large and fine flowers it is decidedly the best to grow them in pots, and to do this the soil must be of a sandy loam and not too rich as the soil is apt to become soggy if there is too much manure. Great care must be taken in watering, and at no time must they be allowed to become dry, and on the other hand never water a plant when wet. By the last of July or the first of August they should be in their flowering pots, they may be fed with manure water after they are in their flowering pots. It is best not to put plants into pots larger than are absolutely necessary, as they look better in pots which are rather small in proportion to their size.

The stopping of the young growths, and tying of them into place, must have close attention. It is better to tie a little at a time, than to wait until the shoots all get large and do it all at once. The grower must first fix in his mind the shape of the plants he desires, and work with a view to that end, constant attention being the keynote of success.

The last stopping should not occur later than the first of August. When finely formed flowers of good size are desired, all but the crown bud should be removed. This is best performed by using a pointed stick or penknife, but care must be taken, or rough handling may destroy the work of months.

It must not be understood that the first flower bud that forms is the one to be retained, as many varieties produce what is known as the summer bud that generally shows itself in May. When first seen, it usually has three vigorous shoots around it. This bud is useless and should be removed as soon as it appears; if allowed to develope, the plants stop growth for a time, and the formation of the next buds will be delayed. When the summer bud is removed several shoots will appear below it, and as many may be left as is thought expedient, the variety and strength of the plant alone determining this. Each of these shoots thus formed, will show another bud which is termed the crown bud, and is the one most likely to produce the finest flowers, if it shows itself at the proper time. Occasionally these buds appear in July, and are known as the July buds, but these are too early, and will produce only imperfect or badly shaped flowers. It is best to remove all buds that appear in July, as by so doing the plants will be induced to make further growth, upon all of which buds will appear about the last week in August or first week in September. These are the ones to be selected, and the buds that make the finest blooms. When the buds are selected all the after-growths and small buds that appear should be removed.

From now on manure water should be used or mulching of manure on top of pots. Sheep or cow manure will do, dressing of bone meal or potato phosphate is good. But all manure water must be withheld on damp or cloudy days. When the buds or petals begin to unfold all feeding must be stopped and only clear water be applied. There is nothing further to be done except to keep the plants in a dry, cool atmosphere and wait for the buds to develope, which will complete the propagation and culture of chrysanthemums to my idea.

The directions as to manure water, etc., may not be as plain as they should be, but in short, I always commence to feed heavily with manure water, etc., as described above, as soon as they are well established in their flowering pots, or when they become pot bound; and stop as soon as the butts begin to show color.

I regret that I am unable to be with you to read this myself and answer any questions that may be asked.

On motion Mr. Fox was authorized to publish and distribute at once the report of General Fruit Committee.

Adjourned.

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OFFICIAL DOCUMENT, **No. 7.**

REPORT

OF THE

PENNSYLVANIA

State Dairymen's Association.

1894.

LIST OF OFFICERS.

President.

H. C. CRAWFORD, Cooperstown, Pa.

Executive Committee

First Vice President, JOHN C. McCLINTOCK, Meadville, Pa.
Second Vice President, GEORGE M. ORRIS, Meadville, Pa.
Third Vice President, HON. J. C. SIBLEY, Franklin, Pa.

Secretary.

GEORGE H. ST. JOHN, Meadville, Pa.

Treasurer.

M. GLENN BEATTY, Meadville, Pa.

Vice Presidents.

J. B. Phelps,	Crawford County.
M. L. Freeman,	Crawford County.
John S. Kean,	Crawford County
Leon C. Magaw,	Crawford County.
Henry Port,	Erie County.
A. L. Wales,	Erie County.
W. T. Everson,	Erie County.
William Marsh,	Erie County.
Charles Lott,	Warren County.
H. S. James,	Venango County.

Col. T. S. Strohecker,	Venango County.
T. J. Forker,	Mercer County.
T. J. Mellinger,	Lancaster County.
Thomas Magee,	Centre County.
William Darlington,	Chester County.
R. S. Caldwell,	Washington County.
Joseph Dillingham,	Montgomery County.
Leonard Rhone,	Centre County.
J. M. Shields,	Jefferson County.

CONSTITUTION OF THE PENNSYLVANIA STATE DAIRYMEN'S ASSOCIATION.

Adopted in 1871, amended in 1882.

Section 1. This organization shall be known as the Pennsylvania State Dairymen's Association.

Section 2. Its purpose shall be to improve and develop the dairy resources of Pennsylvania.

Section 3. Its membership shall consist of such persons as shall pay into the treasury the requisite fees, and of honorary members. The fee for permanent membership shall be one dollar, and for annual membership, fifty cents.

Section 4 Its officers shall consist of a President, Secretary, Treasurer and twenty Vice Presidents.

Section 5. The Executive Committee shall be composed of the President, Secretary and Treasurer, together with the first three Vice Presidents, and shall have the oversight of the affairs of the Association, the appointment of its meetings, and all arrangements for the same, including the annual meeting for the election of officers.

Section 6. It shall be the duty of the Secretary to keep and prepare for publication the transactions of all meetings of the Association each current year, embracing such papers as shall be approved by him. The Treasurer shall keep the charge of the funds of the Association, and shall disburse the same on the order of the Secretary, countersigned by the President; and shall report receipts and disbursements at the annual meeting.

Section 7. Amendments to this constitution may be made at any annual meeting by a two-thirds vote of the members present.

Remarks.

Since all dairymen are necessarily farmers, this association should enlist the interest and active co-operation of every farmer. The expense of membership is but a trifle, and is vastly more than repaid to every member. The inducements to become a member of the association are many, among which may be mentioned the following:

1. Your individual interest as a dairyman and farmer in progressive work. Farming is no longer a trade, but a profession, and the facilities for transportation and interchange of agricultural and dairy products have become such that only those who are fully acquainted with the latest experience of practical dairymen, and the discoveries of scientific specialists, can expect to make their business profitable. This association aims to bring the results of such experience and discovery within the reach of the humblest farmer in our midst, at the least possible expense.

2. The right to attend all the meetings held by this association, to take part in its discussions and make inquiries of the specialists who are engaged by the association to lecture, and to satisfy the honest pride which every intelligent farmer should feel in being a component part of the association.

3. The receipt every year of a large octavo volume of hundreds of pages, amply illustrated with engravings of animals, machines, pomological and horticultural subjects, entomological engravings, etc., furnishing a complete report of the transactions at the meetings of the the State Board of Agriculture, of the State Agricultural Society, of the State Dairymen's Association, of the State Horticultural Society, and of the State College, the whole giving a complete survey of the progress and improvements in every branch of agriculture for the past year. This volume is furnished free of charge, and a copy is preserved in the office of the secretary for every member, who will receive the same upon call at any time after the publication of the same. If this copy is not called for previous to the annual meeting, it may be obtained at the place of meeting at that time.

4. Each member is furnished with a notice and program of each meeting held by the association.

5. Whenever prizes are offered for exhibits of dairy products, none but members are permitted to compete for premiums.

TWENTIETH ANNUAL SESSION

OF THE

PENNSYLVANIA

State Dairymen's Association

Held in Library Hall, Meadville, Pa., January 31 and February 1, and 3, 1894.

Called to order by President John C. McClintock, at 11 a. m.

Committees Appointed.

Resolutions—J. B. Phelps, John Fox, S. N. Chase.
Audit of Accounts—G. D. Heath, M. G. Beatty.
Finance and Membership—T. M. McKinney, G. H. St. John, Benj. Culp.
Intelligence and Nominations.—George Spitler, C. W. Heydrick.
Dairy Utensils.—O. E. Burwell, H. E. Wright, D. H. Lefever.

Report of Secretary.

Mr. President and Fellow Members of the Association:

I have the honor to report that the year has been a prosperous one for the society, though the dairy industry has sympathized with the general business depression of the country. The benefits derived from the Columbian Exposition are not apparently such as we had reason to expect, but there is no doubt that the industry has been stimulated to a certain extent. One thing is apparent, our competitors north of the great lakes are honestly distancing us in the race for the best markets. The deliberations of this session will no doubt give definite and exhaustive information on this subject.

Marked improvement is constantly being made in the methods of treatment of stock. The changes in our pastures consequent upon modifications of climate from the removal of our forests, and the cropping of the soil, have necessitated corresponding changes in feeding methods, which are slowly being adopted by our farmers. In view of these things, your committee has secured the best instructors possible to secure with our limited means for this meeting. Our increasing needs demand a larger expenditure, but no practical method seems to present itself to increase our funds. We are obliged to make the best possible use of our limited means, and we trust our efforts to that end will be appreciated.

We are pleased to note the disposition on the part of our State Printer to expedite the publishing of our reports, and the zeal manifested by Mr. Busch to furnish a creditable book demands our just appreciation. I believe the report for 1893 will reach us within a few days, or weeks, at most. Could the work of publication be accomplished in time for distribution of the previous report at our annual meeting, the cause of present complaint would principally disappear.

The receipts and disbursements have been as follows:

Amount in treasurer's hands at last report, $342.21; received from memberships, $24.00; received from the State department for annual report, $350.00, making a total of $716.21. From this amount there was paid on orders issued to pay current expenses, $343.58, leaving $372.63 for the expenses of this meeting, $23.00 of which have already been expended for advertising.

All of which is respectfully submitted.

G. H. ST. JOHN,
Secretary.

The report of the secretary was ordered to be placed on file, and books and vouchers turned over to the auditors.

The president then presented the following address:

PRESIDENT'S ADDRESS.

Gentlemen of the Association:

As the time has arrived for the annual address of the president of this association, and as we have an unusually long program before us, I shall be very brief in my remarks. We are peculiarly fortunate on this occasion in having with us some of the brightest lights in the dairy world to enlighten us on progressive dairying and farming. And I shall insist on every member lending his assistance to make this program interesting and the meeting profitable to every one present. By so doing we shall be able to reap mutual benefit and secure aid to keep up with the great dairy procession of this country. Never in the history of agriculture has there been such rapid strides in advancement as has been made during the past ten years. And how many of you can look back with me over that period and make note of the improvements that have been made, changing from the old methods of dairying to the modern ones; from the old style of dairy utensils to the latest improved utensils of to-day. And are we, as progressive dairymen, holding our own with our sister States in the great dairy procession? I feel sure that we are, but let us do more than this; we should be in the front rank of the great dairy States of this country.

But with all our advancement in the past ten years, our efforts have been greatly hindered and their success put in serious peril by that gigantic anaconda, oleomargarine, or butterine, which is being sold by thousands and tens of thousands of pounds in nearly every city and town as pure butter, in direct violation of our State laws, which prohibit its manufacture or sale within the State.

And shall we sit idly by with folded hands, waiting for something to turn up to stop this fraud and lawlessness, or shall we let this huge serpent go on wrapping its immense coils around our dairy industry until its life is crushed out? Shall we not rather put forth all our best energies and strength in one mighty struggle to stop the onward march of this huge monopoly? Let every dairyman, and every member of the association in this convention unite to put down this immense fraud. By combining our forces in one grand organization we shall be better able to cope with this great monopoly.

How much better off are we in this State than we were at our last session? It is true we have a Dairy and Food Commissioner to enforce our laws, but what does that avail us? Our legislature failed to make the necessary appropriation to enforce it, when the sum of $25,000 was contemplated by the original bill for the support of the office. Why was it not appreciated? Brother daiymen, ask your representatives in the legislature why they left us out in the cold. Cannot we, during this session, devise some method to lead us out of the difficulty?

Now, it should be the duty of every member of this association to take part in the exercises of this sesion, not only with reference to this subject, but with all that may come before the convention, and so advance our industry to that position that it deserves among the industries of the land. Finally, let me urge upon the members to lend their assistance to build up our association by united work, and so keep our State in the front rank of the great dairy procession, and abreast of the times in the progressive age in which we live.

Discussion.

B. F. Culp. Mr. Chairman, there is one thing that impresses me very much. As the president was telling in his address that we have made great progress in the arts and sciences, and also in the butter business, yet, with all this, we don't seem to advance from a financial point of view. He says that oleo interferes with our profits. What is the cause of this? Who permits this to exist? This is a question that we are all concerned in. Who are the controllers of this nation; the sovereigns of this government? We are. We claim that the people are the sovereigns; and yet we allow men to produce food that is not fit for people to eat, and sell it, branding it as butter. Why not stop this? We are responsible for this. It is our own fault, in a measure. Why not unite? Why not plan for the best interests of the farming and laboring community? I want you to think of it. Give it a candid thought.

President McClintock. If there is no further discussion on this subject, we will call on John Gould, of Ohio, to tell us what our brother dairymen are doing in Canada.

Address of John Gould.

Mr. Chairman, Ladies and Gentlemen:

A story is told of Rev. John Peate, who once upon a time preached in Jamestown, and whose labors were blessed with a glorious revival, and hundreds were added to the church, and the cause of Christ carried forward; after leaving Jamestown Rev. Peate went to Corry, and the state of religion was very low in Corry. To incite his members to do better work he kept telling them about the glorious work done in Jamestown. One morning in love feast when they were giving their experiences, one good old lady said she "was traveling in the path to Heaven, but she had her hopes and fears. Sometimes she almost thought she would never see Heaven." Then she added: "But, Brother Peate, if I don't get to Heaven, I hope I may finally reach Jamestown." And so, to incite you to do better work, you have asked me to tell you what I have seen in Canada; so if you don't get all the glory and honor and profit out of the butter business in this country, we can go over to Canada.

The first thing that struck me very forcibly in the president's address was this question of oleomargarine, and "Who are the sovereigns?" The thing has been solved in Canada. They have a law there that no man shall make or sell a pound of the stuff in the Dominion. If he does, they just simply send him to Ottawa for ten years. They have gone further. No man shall sell or vend filled cheese. They take them to Ottawa for that. So the result is that there is no oleomargarine or butterine taken into the Canadian stomach. This condition of things has been brought about by the men who have the ballot in their hands; and when we stand up for our industry in the same way, Pennsylvania and Ohio and the whole United States will not be at the mercy of Phil Armour.

Last week the greatest dairy convention that Canada had ever seen was held at Ontario. I only wish you could have been present at that meeting. The first opportunity you have, attend one of those meetings in Canada.

The law in Canada does not allow a man to make skimmed cheese. The result is that the Canadian government has the best of this business in that country. To-day, in Canada their highest aim is to see who can make the best cheese, and their exhibit at Chicago was a great compliment to the Canadians. I think they are making a better cheese there than we are in the United States. They are milking about the same kind of a cow, and are keeping it in the same kind of a barn; but their point is to make the best cheese and get it into the best market. A man who takes milk to the factory should have the pay for that individual milk.

I think the pooling business, paying for everybody's milk, is going to go in Canada. At that great convention of 350 cheese makers, factory owners and dairymen, there was only two votes against the universal adoption of the Babcock test to be used the coming year to test the value of milk. One hundred pounds of milk, containing four and one-half per cent. of butter fat will make more cheese than one hundred pounds of milk that has three per cent. of butter fat; but under the present arrangement the man who skims and waters is getting his dividend off of the men who are doing better dairying. Another thing in Canada that they are hoping and praying for (and it is coming) is, that when we in this country shall consume all the dairy products we have in this country, that we shall begin to buy of them. That is one of their great hopes. The reason why we are eating so much oleomargarine is because we have not enough dairy butter to go 'round. They say, "In five years you fellows will not only consume all the cheese you make, but you will want some more." I don't know how it is here, but sixty-five miles west of here Ohio cheese and New

York cheese pass each other on the way to market. We want to stop that. We want each town to make such good cheese that there will be no crossing of freights on the way to market. This means a man thoroughly in love with his work. A patron cannot do it all. There must be united action, each doing his level best, and each having done his level best, then we are able to demand of the lawmakers, protection. I am in favor of protection for my business, and I am a free trader for everybody's else business. I don't want everybody to say that my gold dollar is just like their gilded dollar. We must stop that and demand protection for our business. It will take this man's vote, and that man's vote, and my vote, and then we can say, "You execute the law or you will go down and out." Just think of the butter business of this country. Eight hundred million dollars made last year in the dairy. Had we dairymen paid as much attention to the dairy business as we did to the silver bill we would have had it on a good deal higher plane of protection than it stands to-day. The dairy industry is the only industry in the United States that has not turned its operators in the street this winter to feed on the soup of charity. Some time we will recognize the dairy industry as a great industry.

President McClintock. Do they enforce the dairy laws in Canada?

Mr. Gould. I was told that for five years not one pound of butterine or oleomargarine has been sold in Canada. I went to the Commissioner of Agriculture and said, "Are the dairy laws of Canada enforced?" "No," he said, "there is no use enforcing them, no one wants to go to Ottawa for ten years."

Mr. Culp. As citizens of the United States should we not be ashamed to have our laws violated?

Mr. Gould. It is done simply because you and I sit down and want somebody to enforce them for us.

Mr. Culp. We must be fools.

Mr. Gould. I don't believe I am a fool. We ought to be just as proud of our laws as they are of theirs over in Canada.

Mr. Matteson. I am now in a lawsuit. The first one in my life. Phil Armour has sued the whole State of New York. We are going to have some fun. At our State convention about the middle of last December, a man who is the representative of Phil. Armour, sent a telegram to the convention, asking them if they wouldn't endorse as a convention, the use and sale of oleomargarine in the State of New York. He threw down the glove. Of course we sat down on that resolution. We presnted a set of resolutions to the Assembly and the Senate of our State, and to the Congress of the United States, telling them what we proposed to do. Armour, through his man Hackett, has sued our butter commissioner for interfering with his business in that State. We are going to see what we can do in New York State; and we have lots of stamps and lots of sand; and you kind of keep watch of us and see how we come out. Then you wade in: and if you haven't enough money we will lend you some. We are neighbors. These United States belong to all of us. What hurts Pennsylvania hurts New York; and what hurts us hurts the whole brotherhood of farmers. They are the only honest men in the world. They will water their milk sometimes, but that is only a little falling from grace. John, you made a mistake. There is butter enough That isn't why they sell the oleomargarine. Down in my section we have lots of dairymen who are making good butter; and yet 23 cents a pound is all they can get for it; and the local buyer in my town said to me the other day, "I have got to quit. The boys say I must hold back the butter here; there is an over-production." Yes, the people want it; but it takes money to buy butter. I have seen the time that I would spend $1.50 in one day, and I have seen the time when I didn't spend that in ten days because I didn't have it. A man will buy a pound and spread it thinner. I have all the faith in the world in this grand United States; and if Phil Armour thinks he is going to kill out the great butter industry of our State he will find he is mistaken. Oleomargarine did a good thing for me about twenty years ago. They kept telling me, "You can't tell it from butter; it is as good as butter; it will do, I guess." I have eaten a good many things that went down all right; but after I found out what I was outside of I felt bad. I honestly did. I am built that way. Mark Twain tells a story on himself that occurred when he was out lecturing. He was invited to stay all night with a gentleman. They gave him a very nice room, that was probably occupied by one of the daughters of the house. In the morning he found that he had forgotten his grip. He didn't have his tooth-powder with him. He found a little dish with powder in it on the dresser. He used some of it, and found it very nice. At breakfast that morning he thought he would own the corn; so he mentioned it and said he would like to know what kind it was, as he would like to get some like it; when the little fellow at the table piped up, "O, ma, he has used Aunt Hanner." They had had the old lady cremated, and had her ashes there.

There is an aroma that Phil Armour cannot put in the butter. The kind of a flavor that comes from the clover the cows eat.

Butter is a drug in the market to-day. A gentleman said in this hall to-day that good butter sold for 20 cents last Saturday. We are going to have better times; and next spring we will pick up and be as frisky as you please, and won't ask any odds of anybody.

Mr. Phelps. I will venture to say that there is not a grocery in Crawford county to-day that is not over-loaded with butter. Every corner grocery in this county has so much butter they don't know what to do with it; and still it is coming, at 14 cents a pound. Here is food for reflection. What is the matter? Why is it that that butter cannot be sold for 25 cents a pound? It is because it isn't right; and oleo takes its place. That butter is only worth 14 cents to the merchant who buys it. Why don't you make butter that sells for 25 cents, and the oleo will have to get out of the way? I have fought this thing, and cursed the eleo a great many times; and yet it has its merits. You must make a better article or oleo will take its place. I have sold butter to hotels in cities. Their argument is this: "I can buy oleo better and cheaper than I can go to the market and get butter. My customers like it better, and I tell them it is oleo, and they say it is fine." There you have it. There is the whole thing. I will venture to say that there is not one-tenth part, or one-twentieth part of the ladies in Crawford and Erie counties to day but what think they make just as good butter as anybody. I am down on the oleo law. I think I can see a little speck in the clouds. I see that a Senator in New York has offered a bill in the Senate of the United States, allowing every State to govern itself in regard to the oleo business. Then we want to send men down there who have the back-bone to stand by what the farmers' demand of them. There are thousands of pounds sold in Pittsburgh; and yet there is a great demand for good butter. I mean first-class butter. People will eat it if they can get it.

Mr. Culp. I rather think you made it a little strong. 1 think the ladies in this county make pretty good butter.

Mr. Phelps. If you think that, I cannot admire your taste. I was at one of the best stores in Conneautville not long ago when the merchant was buying butter for 15 cents a pound; and had about three tons there. At the same time he was buying from me at 28 cents, and taking it home for his family to eat. One of the clerks said, "There is as good butter as anybody makes." There wasn't a good pound of butter there. He kept it in a nice, dark room. Some of it was salted with coarse salt.

Mr. Culp. Do you believe the people at those hotels would rather eat the oleo than the butter they can buy?

Mr. Phelps. You may go to these hotels and see if you don't find oleo on their tables. They wouldn't have it if the people didn't want it. The times have something to do with the consumption of butter; but first-class goods will sell every time. A good animal always goes at a fair price.

Mr. Matteson. Don't you believe it is right to make ten cents a pound difference in the butter in the same store? I bought a suit for $10.00, and a fellow in the same store bought one for $24.00. I haven't had any trouble with my customers. I happened to have men who were drawing their 6 per cent. during these hard times. Don't think all butter should be the same price until you have the same kind of butter. A man will buy one cow for $15.00 and pay $60.00 for another; and he has got the worth of his money in both cows.

Mr. O. E. Burwell. I have had some experience this winter. I commenced to make butter about the time the factory closed; and went down to Allegheny to see what I could do with butter there. I told the groceryman that I wanted to sell my butter on its merits. I told him that if it merited a first-class price, I wanted it. He said, "All right, I'll take it." I received my last check last week for week before last week's butter; and have not received less than 30 cents for any butter I have sent to him since the 20th of October.

He could go right on the market in Allegheny and buy all he wanted for 20 to 22 cents a pound. About six weeks ago he could do that; and now he can buy the same butter for 16 and 18 cents. I think the price depends a good deal on how we take care of our cows and how we take care of our butter. What we want is for everyone to make a quality of butter that will demand the highest price. If we had to sell our butter on its merits we would learn something about how to make it and put it in shape to sell.

Col. Frank Mantor. This butter question is of great interest to the people of this county. It was said by Horace Greely that Crawford county butter was equal to any butter in the State. I pay 25 cents a pound for my butter the year 'round. You may go into any store today in Crawford county and you will find the same difficulties arising; and it is no wonder our friend sends his butter to Pittsburgh. People will eat good butter, no matter how hard the times are. The man who has good butter will sell for 30 per cent. higher than the man who is careless in the manufacture of his butter. The merchants in Chautauqua county, New York, raely ever buy any butter. A day is set, and the people come in and sell the butter upon its merits.

Mrs. Busick. I would like to say to the gentleman that at this time of the year butter sells at its maximum figure. Our markets in the west are largely regulated by Elgin prices. Our winter butter making is when we reap the harvest. Butter that will sell for 25 or 30 cents now, the same buyers would not pay over 18 or 20 in June or July for. Our butter market is better at this season of the year than at any other time.

Adjourned at 12 M.

AFTERNOON SESSION.

Discussion.

Mr. Matteson. In all the State conventions I am acquainted with we are sending up our best representative men to the National Association; and that is just what the farmers should have done years ago. So we can be in shape to fight those things that come up; and also to try and build ourselves up so that we shall stand at the head of the list in the dairy industry, and not have our neighbors in Canada throwing mud at us because we do not make better goods. And you will do a good thing to send some of your best men to that convention.

Mr. Gould. The Chicago fellows thought they would be a little smart, and organized a National Dairy Union in the Association; and appointed each one a delegate to go to Cleveland to scoop those other fellows. It is only a question whether they will absorb them or they us

Mr. Matteson. They talk war but they haven't got the ammunition.

Mr. McClintock. They let the Chicago parties get there first.

BREEDING, FEEDING AND CARE OF THE DAIRY COW.

H. S. MATTESON, of New York.

Mr. Chairman, Ladies and Gentlemen: To-day is the first time in my life that I ever stood before an audience in which I didn't know some one person; and I have traveled up and down the earth a good while. I am not so old; but some years I have lived 48 hours in every

24, and it has doubled up. I am glad to meet you, and to look into the faces of the Pennsylvania farmers; and from the conversation that I have had here with these people, I find the Pennsylvania farmer and dairyman is very much like the New York man. He is looking for something better. Things have got to the point when we must have the best in everything in order that we may make a financial success of it; and more especially, perhaps, in the dairy interests than in anything else. The time was when a good, bright, intelligent farmer could hardly have thought that one cow was worth double what another was; while each would take the same amount of feed and care, and one would produce twice as much in a year as the other. That time has passed; and men have come to know that there are cows that cannot, under any possible circumstances be made to pay their way; while others, with equal care and feed, support them, and perchance make a little profit for them.

I propose to-day to talk to you only from experience. I am not a theorist at all; and what I shall say to you to-day on this subject will simply be a recitation of my own personal experience.

I have found out that a cow, to be a number one animal, has got to be born so; and that when a cow is capable of producing 4, 5 or 6 per cent. butter fat, you will find those capabilities in her breeding. I have, in my own experience, been unable to take a cow that by her breeding had no qualifications and get better than 3 per cent. butter fat; even when feeding her up to 6 per cent. I know that this is disputed by some grand, good men in the country; but the point is here: Their experience has been that they have taken a cow that has not been taken care of, and that had never been brought up to her normal possibilities, and he has increased her butter fats and production.

In the science of breeding the first thing you want to know is what you have to breed from, and then set your stakes to what you want to breed to. First find out what you have to do with. It is the most foolish thing in the world for a dairyman to go on year after year and never test his cows to know what they are doing and what they can do. Another thing—there are lots of grand, good farmers, well-read, well-posted men, that breed year after year from pedigree, and know nothing about performance. I wouldn't give a snap for all the pedigree in the world if they haven't performances to back them. So in my opinion the only safe method for a dairyman to follow is to look about in his own herd, and see what he has to start with; and after giving a thorough test for the qualifications of his cow, get an equally good sire, and commence at that starting point and build up a herd. We know, and no man thinks of disputing it, that the laws of heredity are, perhaps stronger among animals—cattle and horses—than in anything else in the world; and I have said, and I believe yet that I am more than seven-eighths right, that there is no animal in existence that transmits its qualifications, its character, its habits, so strongly as does the cow.

I have been breeding for a special purpose for 25 years; and I have found 95 times out of a hundred that the sire gives me the best properties. I will take a scrub or a low grade cow and couple her with a sire that has the best of qualifications, and I will get a better animal and offspring of this than I will to reverse it, and take a first class cow with an ordinary scrub sire; and I will increase the value and powers of the offspring 95 times out of a hundred more from the sire than I will from the dam. I am only giving my own experience in the matter; I cannot explain it. We have lots of men who commence this line of breeding and follow it out to the letter, and they forget that breeding is only the beginning. I was judging stock at a fair last fall; and they had some of the finest stock in that county that there is in the State of New York; and I found some object lessons there. I found men who had followed breeding down to a fine point. They had pedigrees a yard square, and calves that that pedigree would cover up and tuck in around the corners, and leave room enough to put another calf in. They had spent money and time and had produced an animal, and then let it alone. There is where we fellows make a mistake. We are a little too much wrapped up in one thing, and there we stop. I don't want to extend my talk in regard to breeding any further than this: No man is safe to breed from a sire or dam that has not been tested; not only once, but right through the season. He must make a study of their character, their temperament, their pedigree; and then he has something tha he can reasonably expect will reproduce something a little better. Then he must commence the feeding. A man will take a Jersey and breed as fine a calf as you ever saw in your life, and then he will go to work and feed for beef and make a scrub of it. We want to breed, and then start in and feed for a purpose.

Last winter I was visiting in Indiana, and got in among farmers who had been raising corn and oats. They could hardly give a colt away; beef was low, and they had no money. Wheat did not amount to anything; and they took the next best thing, and went into the dairy business. Some of them were fortunate enough to have money to buy with and had bought some nice Jerseys. I went onto a farm near Richmond, Indiana, and saw there four of the finest Jerseys coming a year old, that I ever saw in my life. He asked me what I thought of them. I said, "They are fine." He was feeding corn. He had a machine there that was born into the world to make butter; and he had gone to work to reverse that machine to make it make fat; and he was spoiling his heifers just as fast as he could.

I said to him : "You take two of them away and feed them bran and oats, and keep the other two right along on your corn, and when they come to giving milk just let me hear from you." I heard from him a few days ago; and he said he never knew before what a big fool a man is who goes to reverse the order of nature. They are a failure as milk cows. I can take the best cow on my farm, and while she is in conception for a calf I will feed that cow for a beef animal; and I believe and know that I can injure the milk and butter production of that offspring to a great extent before it is born by feeding the mother of it foods to make beef of. I will commence the formation of a beef producing character in that animal. If you want a good dairy herd, feed every moment until they give milk, and as long as they live, something to produce milk. Of course have foods to keep up the physical strength of the cow; but feed for a purpose. If you don't, you are going to make a failure; and every time a man fails he is a good deal less of a man than he was before.

Now, when you come to talk about feeding you have not only the kind of food to feed; but the time to feed, to consider. It is coming spring; and we calculate to produce milk next summer; and we know that when July comes the grass will be more matured. We want to begin now. It is pretty near the first of February; and we must keep it pasted in our hats that before July we must have some extra feed for our cows. Just as likely as not somebody will have held all the grain production in this country, and you may have to pay $25 a ton for feed. You want to get ready for these things. You want to go to work as soon as you can and put in some peas; then wait until it is warm and dry and harrow it nicely and sow some oats. And then about a week after that fix another patch the same way. About two sowing of peas and oats. And when the time comes that you can, plant some sowed corn. I use three varieties—an early variety, one a little later, and the larger Evergreen corn at the last. Don't wait until the last days of June and look into the pail and see that the cows are serving you the same trick that they did the year before. If you don't put food enough into that machine you will not get milk enough out. That is the trouble with us farmers, we have been trying to get something from nothing.

We breed the finest kind of an animal and we trust to that cow to produce us something, and we do not give her anything to produce it with. Don't condemn your cows. Remember another thing—that you have to feed the food that will produce what you want. Why here a year ago one of the best dairymen we have in our section got a lot of Buffalo feed from an agent at a discount. It was something like saeur kreaut. They make beer, I guess, or whiskey out of it. He said, "I have struck it now; you ought to see them roll out the milk." I saw his wife a little while after. She said, "I wish you would go and see Sam." I keep an old musket about 100 years old; and every time I hear of an agent in town I put in another load. That fellow almost ruined his dairy cows before he saw his mistake. Don't take up with every new-fangled thing that comes along. I will tell you what I feed. I feed oats and bran and corn meal, corn in the ear, cob and all. I have just enough fattening food there to keep the cows in good shape, and keep the milk rich—the bran and the oats. Corn, oats and bran; one-third of each. Some of you will ask where the ensilage comes in. If I don't get a silo John Gould will put me in a hole and set down on it.

We have a pretty good start on breeding and feeding. Now, here is another thing. If you have the best bred herd of cows in the State of Pennsylvania, and you feed them the best possible way, I can put a man in there that will spoil all that you have done. I can spoil it all. He won't take care of them. I came up a road the other day in my own State—we are proud of the State, but I am ashamed of some of the men there, and I wish they would be called home pretty soon, on account of the cows—it was raining and real nasty, and I saw his nice Jerseys standing out there behind a wire fence. I inquired about that man a little—who he was and what he was doing. I found that he had some money left him; is a good farmer, and calls himself the best dairyman in that county. He makes good goods because the other horse in the team stays at home and attends to the business. I found out that he was down town talking about the times. He threw some hay out on the ground and turned the cows out and went down town to see the boys. I treat my cows a great deal better than I do my children, because I haven't got any children. I think so much of them and I use them so well that my wife is jealous of the little Jersey heifer I have. She says, "You cannot go by that heifer without patting her on the face, and you haven't done that with me for a good while." I told her that I didn't want any hard feeling about the matter, but that if she was as remarkable an animal as that heifer was I would have my arm around her half the time. I want to see you treat your cows well. The man that turns his cows outdoors and feeds them there has not the first principles of manhood in him. Another thing. You have seen farmers now and then have a cow that wouldn't give down her milk. I saw one that had a five-pound weight right on her loins. This fellow was talking to me about this cow; he said he was going to sell her. He said: "My wife will milk her and she will do all right. She is the queerest creature I ever saw in my life." He had kindling wood enough piled up there to last me a year, and had a brand new stool under him. He said: "She has spells, and you have just got to go to work and pound them out of her." I want a cow bred and fed and taken care of so that when she sees you coming the milk will begin to come and you can't stop it. Why, I know a man that pounds the milk out of his cows if they don't give down just when he is ready to milk them. If you take proper care of the cow she cannot help but give milk. Now, I don't know whether I will hit any of you or not; but there is another class of farmers who put off the milking until they happen to get ready. They will get up at 4 o'clock and milk their cows, if they want to start away early, and then milk them at 9 o'clock at night, or just when they happen to get home. They find their cows all out of shape, and they can't get into shape. You must have some system in the care of your stock. I know I am stepping on dangerous ground, but that man that lets his cows out at 6 or 7 o'clock, and leaves them out until he happens to get home in the evening, is a sinner; and I have my doubts whether he will ever be forgiven. And any man that puts his cows in the stable in November, and doesn't let them out until May—well, that would be all right if they have the right kind of a stable. Since along last September we have had a great deal of trouble in our county with tuberculosis in the stock. They are slaughtering them there every week or two. I have taken the trouble to go to the barns of all but one of the farmers where the cows have been condemned, and I have found men who believe that cows ought to be kept at steam heat. I don't claim that that was the origin of the tuberculosis. You want to give your cows good air, pure air; and above all, give them a chance to get out in the bright sunshine every day. Right in the middle of the day for about an hour.

Sometimes my cows are not in the stable for two weeks at a time; and last winter they were out for three weeks. Give them plenty of fresh air. These are little points; and you will find one of the best authorities in the country preaching another doctrine—John Gould—and if you go between us you will be about right. Another thing—in the care of this stock remember that you can take a calf that isn't more than three days old, and commence then, and you can predict then in a great measure what it has inherited in the way of temperament and disposition which will affect the quantity and quality of the milk and butter you will get from that animal. Every time you feed or handle a little calf, do it as carefully as if it were a baby. I sometimes take them up in my arms. I will tell you how I used to teach a calf to drink. Father would say, "Henry, go out and learn that calf to drink." I would get myself together and take a pail of milk, and I would get astride of that calf's neck and put my fingers in his mouth, and jam his head down into the pail. Then I would give up the finger business and jam a little more. The calf was in the habit of looking up for something to drink, and I was compelling him to go down for it. About that time he would go over, and I would go over, and the milk would go over. I would as soon try to fall over a wheelbarrow as a calf three days old. With that kind of treatment you can't expect anything but a vicious animal. You have done everything you could to make it so. Remember this—that a cow has feelings. She has rights that we ought to respect, but she cannot talk back to us. In that respect she is a little better than a woman. I can teach the meanest calf in Pennsylvania to drink, in ten minutes. These are little things, but all together they mean much. You must breed for a purpose; you must feed for a purpose, and you must handle and care for them. One of the greatest things for success is to know first what you want; the next thing is to know how to get it, and the third thing is to attend right to business to get it when you know how. Don't ask a cow to eat or drink anything that is not clean enough for you. Then in breeding and feeding you must remember that you are building up a machine to do a certain work, and you must work at that on the same line from the beginning to the end.

The other day I got on an Empire State train that snatched me through that State at the rate of a mile a minute. There was an engine on the front of that train, that in the mind of the mechanic who made it, was born for that purpose. It was built for the purpose of snatching people and loaded cars along at the rate of a mile a minute. The engineer stood there with his hand on the throttle to do that business, and the fireman was in his place to feed it for that purpose. If the engineer had done his work, and the other men had done their work in building it, and the fireman had only fed it to take us at the rate of a mile in three minutes that is all it could have done. Just the same way in the dairy busines; you can be careful of one point and disregard another. Many of you have spent money for breed, and actually you have by your feeding made scrubs.

I went to visit a dairy farm in Chenango county the other day. I want to show you what breeding has done. That man took care of his cows, just as every farmer ought to do. He sold lots of butter. I asked him what it cost to produce that butter, and he gave me the figures. He said: "Put it down 'scrubs.' September, 1880, it took 11.40 quarts of milk to make a pound of butter; that is about 23 pounds of milk. September 1881, 10.85." He had bought three or four Jersey cows and a Jersey bull. "In 1882 it took 10.80." Just see what a jump that was. "Now we have some 2-year-old heifers in 1883 at 9.93 quarts as against 11.40. In 1884, 9.63. Dropped, .30" Then he kept no track of it; the dairy was left there on the farm and he was away .From 1884 to 1891 he didn't take the trouble to keep this. It took in 1891, 7.75; in 1892, 7.60; in 1893, 7.45. Just see what power he bred into that stock. His cattle were fed and cared for in the same way; and as far as food was concerned his grain feeds were always the same. It shows what blood will do. We will take the lowest record. Last September it took 7.45 pounds of milk to make a pound of butter. In 1880 it took 11.40; and it cost no more to keep those cows in the month of September, 1893, provided the grain and everything were the same price that it was before. I will give you another statement in regard to what can be done by feed and care. I shall say nothing of breed in this; only that the man that runs that dairy is the best judge of a cow there is in the United States. He has made a study of it all his life. It was born in him. He doesn't raise a calf at all; he goes out and buys. This will knock out one of my theories, but it will save the other two. That man had a dairy of ten cows, and they had food and care and his good judgment. From that dairy he made 3,979 pounds of butter in 365 days. They had no clover hay or ensilage. Not a foot of ground on that farm has been plowed for 18 years. The whole herd ate $100 worth of food at $20 a ton. He was feeding them bran and corn, and they ate their skim milk. He fed them skim milk and they gave it back again.

I can ask a man questions and find out what I want to without him knowing what I am at. That man is so one-sided that he wouldn't see a fly on the end of his nose.

If you should ask me how to start the best dairy in the State, I should tell you to buy a bull the first thing. Then I should tell you to take the scrub cows you have, and put them through a test. If you have never tested your cows, test them, and you will find that one-third of them have run you in debt every year. They haven't produced as much as it takes to keep them; and you have said, "Dairying doesn't pay." If you are a butter dairyman, when you buy a cow buy one that when you feed her she gives it out in the pail. The cow that takes the feed that you give her and puts it on her back and looks sleek, is not the cow that the dairyman wants to milk if he is successful.

The President. Have you any questions to ask Mr. Matterson?

A Member. I would like to know about sowing peas.

Mr. Matterson. They will pay if they are put where they ought to be. Sow them on the sod and plow them under. Unless they are down deep they feel the effects of drought and in a dry season will dry up and turn yellow. If it is something that had a crop on last year and I want to use it, I put peas on. People condemn peas because they don't give them a fair shake.

Mr. H. E. Wright. How much corn in proportion do you use?

Mr. Matteson. One-third each, by weight.

Mr. Miller. About the churning—why will the butter not come sometimes?

Mr. Matteson. About as long ago as I can remember they used to say it was bewitched. If I had a batch of cream that would not come I should say it was bewitched. The Babcock test is one of the grandest things for the dairymen that has ever been invented; but if I am testing a cow for my own use I wouldn't give two cents for it. I want to milk the cow and weigh the milk. I want to find how many pounds of butter I can get. Then one thing greater than all the rest —I want that cream to be tested to see how soon I can stir it into butter. When I began testing my dairy I found cows there that it took an hour to stir that cream into butter under the most favorable circumstances. When the butter globules are small they will not separate themselves from the milk readily. Then I found other cows that three or five minutes would stir their milk right into butter. I don't look as though I had an evil disposition, but I have when you hitch me onto a churn. I could spoil with my temper the best churning of butter in Pennsylvania. When I churn about ten minutes if it doesn't show signs of coming I commence to get mad, and I ask my wife to go over to her mother's and stay awhile. For the last twelve or fifteen years I have churned in about ten or fifteen minutes for ten months in the year. There are a hundred things that cause the butter to not come. It may be too sour or it may be too cold. I don't know as it could be too hot. I tested my cows and took the ones that took the shortest time, and said, "You are just what I want." Some people tell you to churn twenty or forty or fifty minutes. If you will tell me what the process of churning has to do with making good butter, I will take you and board you a month while you convince me of it.

Mr. John Fox. Do you think skim milk would do as well as other foods?

Mr. Matteson. If there was any butter fat that was not taken out the first time we get it the next time. It is the way we get 3,979 pounds of butter from ten cows.

Mrs. Busick. Would it answer the same purpose if you would just churn that milk over instead of feeding it to the cow?

Matteson. We can feed the cows quicker than we can churn. When the cows go dry we lose what is on hands, probably, but I am not sure but what we get it when we begin again. (Laughter.)

A Member. How much would you feed?

Mr. Matteson. John Gould weighs 138 pounds and I weigh 204, and he eats more than I do. You must study the animal. I believe there are cows fed beyond their capacity. You must study their capacity to assimilate feed, and when you get one that can assimilate a good, big lot of it, she is the one you want. John is a better man than I am because he can eat the most. If you had a lot of men around like John Gould, prices would go right up. The dairyman needs to study the wants of his cows more than does the professor of a college the wants of his students, because the professor might make a boy believe what was not true, but you cannot fool a cow's stomach.

Mr. H. C. Crawford. Would you milk while the cows are feeding, or wait until after?

Mr. Matteson. I want a cow just as quiet as she can possibly be while I milk her. Did you ever notice that when a calf runs with the cow, or a colt runs beside its mother, that those animals will always stop eating while the young are eating? A cow eating will be uneasy, and if she is uneasy you will be. Keep your cows as quiet as you can. If you have a cow that enjoys music, whistle "Hail Columbia," or anything else. I spoke about habit in cows—If you have been in the habit of feeding a cow at a certain time, she will be uneasy and will not give her full flow of milk. I feed my cows before they are milked, because it happens to come that way. When I am feeding oats and peas they eat them up, and then straighten up and chew their cuds and shut their eyes, and seem to say: "I am doing a good square thing for you." Do your feeding inside. Don't ask your cows to go out and pick up corn or oats or peas or anything else. There is nobody but my wife and me at home, and I wouldn't like to eat off my plate at noon unless she washed it. I don't believe a cow likes to pick up her food that way. If a cow hasn't taste and refinement enough about her to ask you for something clean and nice she isn't worth keeping.

Mr. Crooker. How much peas and oats do you sow to the acre?

Mr. Matteson. Two bushels of peas and two of oats.

Mr. Gould. I sow one bushel, three pecks to the acre.

Mr. Matteson. Feed it green. If you have more than you want to feed green, cut it and cure it like hay and put it up.

THE POSSIBILITIES OF DAIRYING IN NORTHWESTERN PENNSYLVANIA.

R. S. HARTLEY.

Mr. President, Ladies and Gentlemen: As I was asked to present a paper at this meeting, and the question was asked me, by one of the members of the association, "Why not take for your subject, 'The possibilities of Dairying in Northwestern Pennsylvania.'" So I will do as well as I can with this subject. In the first place, we have in this part of our State as fine a country for the dairy business as can be found anywhere in the United States; for our lands are well adapted to dairying, as we have good pasture land, pure water, and we can raise as good corn for fodder and ensilage as can be raised anywhere.

And, surely, we have as expert dairy maids and dairymen as there are in the United States as the butter score, at Chicago the past summer will show.

I presume you all have read how the butter scored in the great exhibition. All of that from Pennsylvania scored above 90 points excepting two packages and the average for the whole was 94 points. I doubt if any other State, can show a better average for the whole exhibit than can Pennsylvania. And those of you that were at the Great Fair and went into the Dairy Building, know how the butter was taken care of. I asked the gentleman in charge of the Illinois Dairy Exhibit where to find the Pennsylvania Dairy Exhibit, and who had charge of it. He laughed, and said that he did not know that Pennsylvania was a dairy State. Said he, "There is the Pennsylvania Exhibit, but no one has charge of it. I have been here all of the time, and I have not seen anyone taking care of it."

I do not think that the few that did send butter to Chicago are satisfied with the way the butter was handled while there; and I, for one, did not recive an acknowledgment of the receipt of the butter, at Chicago; and the only official score that I received was for September.

I wrote to Mr. John J. Woodward, asking him to send me the official score for the four different months' exhibits, and he said he could not do it, as the score for June was lost, excepting for two packages, that of Corry Creamery, 98 points, and that of John C. McClintock, 95 points.

The average for butter sent from northwestern Pennsylvania averaged 94¾ points for the four months' exhibit, a very creditable showing, I think, for northwestern Pennsylvania; as Gov. Hoard, of Wisconsin, says that 95 points out of a possible 100 is practically perfect, and now, to tell what little I know about dairying:

First of all, you want a cow adapted to the business. So, I say, get a good herd of Jerseys, or Jersey grades, and the more Jersey blood the better, as the Jersey cow showed herself to be the dairy cow, par excellence, in the great breed test at Chicago, for both milk and cheese as well as butter, I am a Jersey breeder, so what I have to say will be in favor of the Jersey cow as the dairy cow.

"The claim that the Jersey cows at the World's Fair breed contest were better specimens of their race than those in the other classes, sounds like the talk of a man who carries nothing to the fair but tells what he might have brought. Neither the judges nor the public have anything to do with what was left at home. The breeders of Shorthorns and Guernseys accepted the conditions and entered the contest knowing its importance and will have hard work bracing up the reputation of their cows by admitting that they were careless in making selections," says Mirror and Farmer.

The Jersey cow has settled one of the disputed questions in cheese-making. She has demonstrated that the milk that contains the most fat will make the most cheese, and cheese of the best quality, gallon for gallon. And she has exploded the vicious skim-milk cheese doctrine that Jersey milk needs to be skimmed for cheese. She has demonstrated that skimmed milk can never make an honest "standard" cheese. The honest "standard" should be the best grade of whole-milk cheese. The richer the milk the more cheese, and the better cheese.

I will now tell you what my Jersey cows have done for the past two years, 1892 and 1893. In 1892 I milked 17 cows. They gave me 6,056 lbs. of butter, an average of 356¼ lbs. to the cow. The average price for the year was 30 1-6 cents per pound, for butter sold, $1,826.89 from 17 cows, $107.46 per cow, for butter alone, not counting the value of calves or hogs raised on the skimmed milk.

In 1893 I milked 20 cows. They gave me 7,003½ lbs., 350¼ lbs. per cow, and $112.08 per cow, as the butter sold at an average price of 32 cents per pound, not counting value of calves and hogs raised.

I try to make gilt-edged buter, and sell it for a gilt-edged price. I supply private families with what butter they need at 30 cents a pound the year round, and what I have to spare in the winter time, from September to June, I get 35 cents for; and I find ready sale for all I can spare.

I started out to tell you what little I know about dairying. Well, we have a partnership arrangement at our place. I furnish the milk and my wife makes the butter. If she was here, she could tell about butter making better than I can; but I will do the best I can. We set our milk in glass cans, in what is called the Crystal Creamery, skim in 12 or 24 hours, if we have room in the cans to leave the milk that length of time.

We churn the cream in the Davis swing churn, washing the butter in the churn, and packing the butter in any sized package called for by my customers.

My Jersey herd is a show herd, as I have shown at seven fairs each year for the past two years, and have been very successful in the showing. I have been showing Jerseys for the past ten years, at our local fairs; but in 1892 and 1893 I have been to some of the large fairs, and expect to go again.

My herd would have made a much better showing for butter had they not been away from home so much to the different fairs. Two different weeks I had 11 milkers away, and never less than 5 milkers at any fair. The cattle were driven about 200 miles and carred about 1,000 miles.

Anyone that has had any experience in showing cattle knows that a cow that has been knocked about in the cars and punched around on a fair ground will not do nearly as well, when she returns home, as she would have done if she had been at home all the time.

POSSIBILITIES OF DAIRYING IN NORTHWESTERN PENNSYLVANIA.

R. S. HARTLEY, Freehold, Pa.

Discussion.

Mr. Culp. It seems to me a little strange, if we can make a record like that, that this is not counted a dairy State. It seems that our record was better than the others.

Mr. Hartley. This is the score for Pennsylvania butter shown at the World's Fair.

Mr. J. B. Phelps. I would like to ask Mr. Hartley about his feed; what his feed costs.

Mr. Hartley. I have 63 head of cattle on the place, and six horses. I buy nearly all my grain. I couldn't tell you just what it costs to make the butter.

Mr. Matteson. What is the cost of your cows' rations to-day? Do you suppose the man is born who can tell just what a pound of butter costs.

Mr. Hartley. No.

Mr. Matteson. One man says, "I make my butter at a cost of ten cents per pound." Roberts asked him if he was sure that was just what it cost. He said he was; but before we got through asking him questions he did not know nearly as much as when he began.

Mr. J. B. Phelps. This is a question that interests us. If butter costs 25 cents a pound to produce, and we only get 25 cents for it, we don't know where we are at. I claim that I know very closely what it costs me to make a pound of butter. If a man in New York State couldn't answer, probably some of the Pennamites can. I will say that when I weigh out my feed, and get so many pounds of butter from it, I know what it costs me. It costs me 14 or 15 cents a day for cows' feed, and when I get so many pounds of butter I can tell just exactly what it costs to produce it.

Mr. Matteson. The gentleman is on a good track. We ought to know just what everything costs us, and we think we do know, but every little while we make up the balance sheet and we find she don't match just right. One man will make butter at 25 cents a pound, and another man will feed the same and lose money. I saw a gentleman lately who was a milk producer. He said, "My milk brought me $123 for the month of December." I said, "What is your grain bill?" He said he didn't know. "Yes," I said, "you do know." "Well," he said, "I guess I have it in my pocket." I looked over that grain bill; it was $121 for the month of December. He was getting 2.5 cents a quart for his milk. No man says you cannot make milk at a cost of less than three cents a quart, and he will show his figures that it did cost that; and right over the hill you will find a man who says he is getting rich buying the same kind of feed that man does. No man living can tell. Make your butter when you can make it from the feed that will make the most at the least cost.

Mr. J. B. Phelps. I have been working on these lines for a great many years and have found out the cost of production. I believe to-day that 19-20ths or I might say 49-50ths of the farmers in Crawford and Erie counties don't know what it costs them to feed a cow. When they will take the scales right into the barn and weigh the foods, it will be a great eye-opener, in my opinion. I am perfectly satisfied that I can tell within the minutest fraction what it costs me to feed a cow a day. If I get the butter out of it by the latest improvements, don't I know what I am making from my cows? If I feed $50 worth of feed and sell $60 worth of butter I have $10 left. Many men to-day are feeding their cows the old way and sending their milk to the factory in the summer and then they say that dairying doesn't pay. These questions want to come up before this meeting. Let a man find out what he is doing. Lots of men don't know whether they are making a cent or not. Weigh your feeds and find out what they will make.

Mr. E. S. Crooker. You say it costs 14 or 15 cents a day. At what price do you figure that ensilage?

Mr. Phelps. Two and one-half tons ensilage to a ton of hay; the value depends on the quality, and we have to estimate that. That is the only lame thing there is in the whole chapter. Then I weigh that ensilage and figure out what it is worth.

Mr. McClintock. Your ensilage costs about seven cents a day.

Mr. Phelps. I am an ensilage man all over.

A Member. Will Mr. Hartley tell us what he feeds?

Mr. Hartley. I am feeding about four quarts of wheat bran; and have my corn ground on the cob, and feed about a quart of it twice a day, and four quarts of wheat bran. I feed good meadow hay mixed.

Mrs. Busick. I would like to ask Mr. Matteson whether he would favor the feeding of clover hay.

Mr. Matteson. I am not in favor of steamed food for cattle. I would just as soon cook it as not, but let it get cool before they eat it. I have not fed a horse anything but chop for 24 years. I can keep them cheaper than T. B. Terry can on clover hay or anything else. I believe clover hay is better cut for any animal. They must have lots of cud chewing for exercise if you keep them in the stable and don't let them out.

Mr. Phelps. The cow will mix her hay and grain all right. She will mix them like a cyclone, in her stomach. They will get together all right. And I don't want to feed any of my cows cotton seed meal, either.

Mr. Matteson. I won't feed it to my cows; never did. I tried the Buffalo food on my cows. It will make more milk than any feed I ever took hold of. I won't say you can get butter fats out of it, but I believe you can increase the milk flow wonderfully. You know the Holstein milk. Jacob originated the Holstein breed. I have traced them back and settled that. They were marked with the spots, and the milk was marked with water. Jacob marked those cattle, and I know it. (Laughter.)

Mr. Phelps. Some people think they can feed the milk right into one end and milk it out at the other.

Mr. Kelly. My experience is that if we are feeding timothy hay we had better cut it into lengths of about three inches.

Mr. Matteson. Don't cut your feed too short.

SOME DAIRY ? ? ?.

MRS. KATE M. BUSICK, Wabash, Ind.

The ? lies at the base of all human progress and development, even if it be not conceded that it forms one of the basic foundations. Admitting that "man began life as a savage," his capital stock of knowledge and acquirements was limited to the minimum. He was ignorant of everything, except the craving of his physical wants,—had nothing to unlearn—nothing to forget. When the world was young, ideas were slowly evolved, and equally as slow in finding a lodgment in men's minds. The centuries grew gray before civilization was evolved from barbarism, and uncounted ages had been gathered with the crypts of oblivion while man was slowly emerging from a state of primal ignorance, into a thinking, sentient being, and so long as mankind was content to plow along in the beaten paths of their predecessors, content with their surroundings, doing as their fathers did, because their fathers did it, the routine of their lives undisturbed by innovation or change, just so long was progress barred, and so far as they were concerned, while the world grew older, it grew no wiser; and had the spirit of unrest not crept into the human heart, yesterday, to-day, and forever would have been on the same dead level of ignorance and stagnation.

Although the first interrogation of which we have any authentic knowledge wrought lasting misery to the race, yet it has ever proven an elevating and uplifting power, the stepping stone from one height of progress to another. In dairying, as in all other occupations of manual labor, the origin must be sought far back in the mists of antiquity. The pastoral peoples inhabiting the Eastern Continent, ages before the dawn of Christianity, were the owners of vast flocks and herds, and the dwellers in tents nearly 2000 years before the Christian era were makers of butter. Rude and primitive as were the methods and appliances, no doubt, yet in a land flowing with milk and honey, they evidently answered all purposes, and butter even in that day was on occasions of ceremony served in a "lordly dish." Frequent mention is made in ancient writings of butter, but it is usually spoken of as an article used in the manufacture of unguents and medicaments or ceremonial sacrifices, rarely mentioned as an article of food, and hence we must infer that its use as such by the common people was unknown. As it is not our purpose to ransack the volumes of legendary lore in order to ascertain who owned and milked the first cow, or churned and sold the first batch of marketed butter, we will confine ourselves to some of the most practical ? ? in dairying. In this utilitarian age, when progress marks every department of human industry and "Forward" is the watch word all along the lines of human effort, no laggards are tolerated; and whoever fails to keep step to the music of the advance is relegated to the rear. Life is too short, crowded too full of opportunities, to permit of loitering in the busy marts of trade and traffic, and the hosts of eager, hurrying competitors that throng all the channels of industry brook no delay in the attainment of their objects. The question that most frequently confronts every one in business is "will, or does it pay?" This is no mercenary interrogation, because in the struggle for bread which means existence, and butter as well, every one should have an equal and abiding interest, as all have an inherent and equal right. In former years farmers were in a majority of instances content to "think the same thoughts that our fathers had thought, to do the same work that our fathers had wrought," plod unthinkingly along in the same ruts worn smooth by the footsteps of their fathers and mothers, without ever stopping to investigate and see if there might not be some possibility of a better way. We are apt to be tethered to our traditions and loth to change the practices of the good old times, when the farm and its "accessories" were managed more by faith than "common sense" rules and regulations. When the devout farmer relying on the Biblical promise, that "seed-time and harvest should no more fail," put in his crops in a "helter-skelter" sort of a way, expecting the Lord to "even up" and adjust all differences, about harvest time and thus offset all negligence and deficiency on his part, by the exercise of some "special providence," because "He had promised," you know; he was banking upon the mythical capital, hypothecating his bonds as one might say, without any visible or substantial assets. If the winters' frosts and snows had mellowed and enriched his soil, so that his seed bed was in good condition for spring planting, if the season was propitious and autumn found him with his granaries full to overflowing, his hayricks of generous size and his cattle fat and sleek from their abundant summer pasturage—why, if he was a pious man, and I speak it in all reverence, the "Lord had blessed him most abundantly;" if he was one of the other sort, he considered himself "a lucky fellow," he just got everything all right in the nick of time. "These book fellows couldn't learn him anything about farming," etc., etc., and he glorified himself accordingly to the same extent, because he fancied he knew just how the thing was managed. But suppose the season is what is termed "a bad one," either "too wet" or "too dry." The one farmer, a thoughtful, studious, observant man, has his land well in hand, has it pulverized thoroughly, well fertilized, completely tile drained, if such a condition is necessary, and then notwithstanding the untoward weather he reaps a fair average for his labor—his neighbor adjoining, who conducts his farm operations by faith alone, writes "Failure," all over his broad acres. What maketh them to differ? The Lord as in times past sends rain and sunshine upon the just and the unjust, the same climatic influences, the same soil, the same surroundings—the only difference, conditions of tillage in which the one by the exercise of judgment, common sense—call it what you will, puts forth every intelligent effort for success, leaving no stone unturned that will conduce to and insure that success, the other simply follows the years' routine, that has been his practice all his life without a thought of change, and then ascribes his failure to "luck," or the Lord, just as his devotional feelings chance to predominate. The whole matter lies in a nut-shell, the one mixes brains with his business by employing every intelligent means to guard against disaster, the other by stolidly ignoring all extra precautions and labor, invites it. "The Gods help those that help themselves," and in no branch of farm work is this better exemplified than in the work and productions of the dairy, and so the first pertinent query that presents itself, What is a Dairy? Webster defines it as "That department of farming which is concerned in the production of milk and its conversion into cheese and butter." This may be still further amplified by including the production of milk for sale to consumers residing in towns and cities. At a first glance this appears to cover the whole ground, when in reality it is only the simple summing up or conclusion of the whole matter. In the production of milk, whether for butter, cheese, or consumption in its original state, many preliminaries must be provided for and first of all the cow, as she is the machine by which you expect to convert your hay, corn stover, and other farm products into money with the least possible outlay of capital and labor; her selection is of the first importance. The time has happily gone by when a cow for dairy purposes was anything enclosed in a cow's hide, wearing horns and hoofs and giving some sort of milk. This is an age of "specialties," and we now have the "special purpose cow," whether for milk or cheese or butter depends entirely upon the particular branch of dairying one proposes to enter. If you designed opening a "milk route," you would not select small, rich milkers, if butter were your object you would be unwise to stock your dairy with immense milkers whose copious outflow contained but a small percentage of butter fat; or if cheese were the objective point aimed at, you would not employ either of the above, but seek a happy medium between the two, and select a cow whose milk was rich in casein, moderate in yield and fairly rich in butter fat. It is a principle in philosophy, that what is gained in power is lost in velocity; the two, overpowering force and immense speed, have never been united in the same machine with even the semblance of success; and so it is with the profitable cow, it is beef versus butter or cream versus fluids. We sometimes hear of a "milking strain" of the beef breds, but when you come to investigate their whereabouts they are always "over in the next county," or in some adjacent State. It is simply preposterous to claim that you can make butter and beef at the same time or from the same animal; one or the other will claim precedence and quite often the gain in either will not repay cost and trouble for the experiment with a cow of the genuine dairy type; no needless waste is ever encountered, she will as surely fill the bill, for which she is designed as a machine, for like a machine, she was built, bred, and trained for that specific purpose. Having started then with the proper kind of an animal, how shall she be fed, cared for and treated in order that she shall produce the greatest profit to the owner in return for feed and labor expended? How shall she be fed? is the next question in order, a question that has occupied more space in our dairy journals than any other topic within the past ten years. Volumes have been written, lectures innumerable been delivered, exhaustive experiments conducted by scientists in our agricultural schools and experiment stations, tables of statistics of the comparative values of different foods have been compiled with laborious research, the laboratory of the chemist has been pressed into service, every channel and avenue of information ransacked, and all with a view to determine and demonstrate how a cow should be fed, in order that she should be made a paying factor in the great world's struggle for subsistance; and after all has been said, we find ourselves but just upon the threshold of success in our researches. There is no cast iron rule for feed rations that may be properly followed for all cows, because they, like their owner, have idiosyncracies, as well as tastes and inclinations of their own. For instance, you may take two cows of the same breed, giving nearly the same amount of milk, feed and care for both alike, let their surroundings, etc., be as identical as possible, both will eat and assimilate their rations alike, yet the one will put the extra fat derived therefrom into the pail, while the other one will appropriate the same to her own use in laying an extra amount of fat upon her frame; or if not that, will give a greater flow of milk, with no corresponding increase in richness. Again, one cow will eat and thoroughly digest a rich, heavy ration, her neighbor in the next stall will eat the same and void half of it in an undigested condition although apparently in as good health and condition as the other. One cow is seemingly always hungry, that is she always comes to the manger with a hearty relish for the food and a vigorous appetite; another is a dainty, mincing creature, very particular about what she eats, and very soon satisfied, scarcely ever cleans up what is given her, yet appears to be in robust health; and so the successful dairyman must study the characteristics of the several cows and adapt the rations to the individual's needs and requirements. How shall she be cared for? In the very best manner possible. Let her quarters be light, well ventilated, kept clean and warm, good bedding, with sufficient space to lie down comfortably, secured with a neat fitting halter or a neck chain, but avoid the cruel, torturing stanchains as you would the plague. I can conceive of no more adequate punishment, than to compel the man who first invented this barbarous method of confining cows to wear one of his own inventions for six months. I think his sufferings by that time would demonstrate as nothing else could, the tortures that have been needlessly inflicted upon our helpless, innocent cows, by the thoughtlessness of their owners in thus confining them. An uncomfortable cow will never, can never do her best, and as dollars and cents are what we aim at in the dairy business, the thinking, progressive human owner will seek for a financial consideration if no higher motive actuates him, to provide for his domestic animals all the comfort that re is capable of giving them. Lastly, but by no means the least item in the count, is kind and humane treatment. The true type of the best dairy cow is a nervous creature, exceedingly susceptible to her surroundings. It took many, many years to arrive at the conclusion that the milk giving function was a nervous secretion, or rather a secretion influenced by and dependent upon nervous excitation. Many long continued and costly experiments, some reaching over years in duration, were undertaken to ascertain upon what conditions the secretion of the lacteal fluid, known as milk was produced, and what factors in the organization of the animal were most potent in influencing this secretion. We know that when the lachrymal glands are suddenly or violently excited they yield tears, whether the emotions be those of joy, grief, or anger. Violent fear pales the face, sudden anger suffuses it with red, the facial nerves controlling the blood, sends it to the heart in the one case, or forces it to the brain in the other. How or in what manner these occult physical forces effect these diverse changes we cannot tell. We only know that the facts are patent to every observer and so we have to arrive at that stage in investigation and experimental observation that we know that the secretion of milk depends upon nervous force and energy. We know that sudden fright will reduce the flow of milk in a cow, that the fear or dread of punishment or pain will have a like effect, and not only will it decrease the flow, but it has been known to so affect the product as to render it absolutely poisonous, and instances are on record where children have died, with all the symptons of poison from being fed milk drawn from a cow while laboring under the influence of extreme fear, or intense excitement. So a man who habitually beats, kicks, or abuses his cows, deteriorates their products and render them less profitable in a pecuniary point of view, as well as brutalizes and degrades himself. Gentleness coupled with firmness should under all circumstances, be the rule governing the action of those in charge of our domestic animals. An ill-tempered man or boy, who strikes or kicks a defenceless cow, while milking or caring for her will sooner or later develop ugly tendencies in the animal, while such treatment of a bull will as surely devlop and antagonize all that is vicious, fierce, and uncontrollable in his nature, as that cruelty and abuse will make cowards and liars of children. A man with an inherently ugly, cruel nature, whose instincts are ferocious and vindictive has no more business in a dairy barn, than a bull has in a china shop; because, aside from the unnecessary pain and uneasiness caused, the shrinkage in values of the milk and butter products will be considerable enough to cause a very material deficit on the profit side of the ledger. Not the milk and butter yield alone is thus affected, but the offspring from ill used cows is sure to bear the impress of such cruel usage, either in their dispositions, or their physical conformation. Whoever saw a half starved, beaten, neglected cow bring forth symmetrical, well formed, vigorous, lusty calves? With prenatal surroundings all against them, the wonder is that any survive the harsh treatment of their dams.

Nor is these considerations the only ones to be entertained. There is frequently a "penny wise pound foolish" custom in vogue in stinting the young calf in its feed, in order to make a few ounces more of butter. There never was a graver mistake made in dairy matters and it is only equaled by the unwisdom of the man that "killed the goose that laid the golden eggs." If in dairying it is inexpedient to raise the calves, kill or give them away, to some one, whose interest it will be to feed them well and rear them for market, and just here is a nice point to determine whether it will not pay to keep and raise the surplus calves for veal. Of course, the dairyman who owns and milks good dairy stock will be short sighted if he destroys or gives away his heifer calves dropped by the same. A good cow if bred to a good dairy sire, is reasonably sure to drop a good calf, which if a heifer, will in its turn grow into a good cow,and such offspring carefully raised and kindly treated will in a short time take the place of cows too old for profit or fill the places made vacant by death or accident. I know of no more wasteful method than the modern "slaughter of the innocents" going on in numbers of our dairy farms out west, and the necessity of replacing cows past a profit bearing age by the purchase of new ones, at a much greater cost than it would take to raise them from their own stock. In these days of fierce competition, when margins are narrow and profits cut down to the minimum rate, it stands every one in hand to practice what are sometimes sneeringly denominated the small economies of business. I would not advocate a cheese-paring or niggardly policy, but a close attention to the little details; a rye straw skilfully manipulated will empty a barrel as thoroughly as an open faucet, though it may consume more time in the operation. Take care of the pence, the pounds will take care of themselves, "was never more thoroughly in accord with the laws of business than at present." The old Scotch proverb that, "Many a Mickle Makes a Muckle," holds good in the dairy, if you can by good care and judicious feeding increase your cow's product by but a few ounces each day, the aggregate for the year will present a sum that will astonish you. How can this increase be effected? I answer by extra attention, observance of the wants of the cow, extra feed and a little extra attention to the details. Every intelligent dairyman or woman knows that a cow will first of all appropriate to her own use the food necssary to her subsistence; all over and above that amount inures to the benefit of her owner, albeit to his shame be it said the generous creature ofttimes shares her starvation rations with a stingy owner, but as said, every pound of food eaten, above what is necessary to the support of the animal, is returned as profit. Some dairy farmers have adopted a system of regular accounts with the individual members of their herds, they are debited with every pound of food eaten and credited with every thing returned in the shape of milk, cream, butter or cheese. To the average dairyman this seems rather onerous and yet it is the only correct way in which to decide the much mooted question, Does Dairying Pay? A merchant, a banker, a manufacturer would hardly be deemed worthy of the name, did he not keep an accurate account of all his sources of revenue as well as expenditures, outgo and income must be regulated and systematically recorded, else like the celebrated Texan he will be found at the end of the year inquiring "where he is at?" with a rather hazy idea that he is nowhere in particular as relates to money matters. If "a penny saved, is two pence made," it is certainly the part of prudence to know just how and where the pennies went; and if any remain, to whom, or what the credit is due. In former years the ability of each individual cow was largely a matter of guess work, and many a sleek, pretty animal was credited unjustly, with the profits yielded by her ragged, bony neighbor, the latter's ugliness telling against her in the scale of revenue. Now, thanks to the disclosures that are made by the "Babcock Chemical Test." Every one can with absolute certainty tell the profit bearing cow and thus avoid the mistakes of mere conjecture and hazard of guessing; for say what you will, actual test is the only correct method of judging a cow, and judged by that test, her merit as a factor in the butter, dairy must be recognized, and I have no hesitation in saying that by its aid, thousands of dollars might be saved to the dairymen of this State alone by sending to the butcher's block the unprofitable stock that is now being fed at an annual loss; for the cow that doesn't pay a fair percentage upon her original price and cost of keeping, is a losing investment. In conclusion permit me to say, weed out your inferior stock and put that feed into better paying animals and secure better results by better care. I do not know that I am addressing a single one who does not properly care for and feed his or her stock, and yet I would be recreant to the promptings of my own conscience, were I to close without an appeal to your sense of humanity in favor of good treatment of animals. Nothing that breathes but hath its right to live and enjoy the benefits of life so long as it trenches not upon the rights of others. Aside from the everlasting reiterated truism, "it pays," aside from mercenary considerations of profit and loss and the sordid view of dollars and cents alone, I would urge it as a refining and elevating influence in the home, because of its humanizing effects around the fireside. Whatever is brutal and cruel in the treatment of our dumb friends reacts upon and imbrutes first the perpetrator and then surrounding companions, and by just so much lowers him or her to a place beneath the stations of true man or womanhood and influences children and dependents to become maybe in after years neighborhood terrors or candidates for our reformatories and penitentiaries. The chance seeds of kindness we drop by the wayside may germinate (they are never lost) and grow up in after years to bless generations long after our names, writ in dust, have perished from the memory of man. The evil that men do lives after them, the good is often, but not always interred with their bones.

Discussion.

Mr. Matteson. It would seem entirely out of place if some of us did not compliment the lady on the very good article she has presented. Of course you know that I am about the happiest man in this crowd, because she and I agree. The closing remarks in her paper should be observed, if nothing else. I believe in taking the best kind of care of my cows. Look at me—I am half fed, but I am taken such good care of that I don't show it. I don't know what I would be if I didn't get any more care than some men give their cows. Love your wife and your children, and then take the old cow right in with the rest of the family. I want to thank the lady for that paper. I have been acquainted with Mrs. Busick through her articles in the papers, and am going home a better man than I was before, if that can be possible. (Laughter.) We don't all agree on some of these points, of course. We don't all want the same woman for a wife; and it is a mighty good thing that we don't. Some men think it is the most humane thing they can do to take the horns off their cows. A Baptist deacon in our town paid a fellow a dollar to take the horns off his one cow. I went before the legislature and knocked out the dehorning bill. I don't believe in it because I don't think it is necessary. I don't believe in it because I think it is inhuman. I don't believe in a man doing anything because it is the fashion to do it, when it is a damage. In Herkmer county and several counties in New York—great dairy counties of that State—35 years ago you couldn't find a cow out of 50 that had a tail more than a few inches long. It became the fashion to cut them off. It soon died out. We didn't de-tail our cows. I have great hopes for this American people; but we get on a wild goose chase, and away we go. I do believe there are times when dehorning seems to be a necessity. I have seen it when two cows would take a little brush, and the whole shebang would pitch in and there would be a free fight and somebody would get hurt.

I have two little Jersey heifers that, whenever I let them out in the yard I know there is a fight on hands. If you try to put all of your cows through the stable door at once and take a club and a dog—in a little while it would be a good thing to dehorn them. But if you will take care of the cows as Mrs. Busick will have it done, you will have no trouble. I have milked cows for 43 years. We have had Devons; and we have never had an animal injured on our farm by being hooked. We have had some fights there once in a while. I have had a cow get her horn broken off.

Mrs. Busick. I am thankful to you for giving an expression of your opinion. For years and years I have adopted that idea and have advocated it in farmers' meetings and associations where the subject came up. I have argued that it was not only useles but it was absolutely hurtful to the animal from a pecuniary point of view. The cow is a nervous creature; and whatever will tend to give her nervous system a shock will in a measure deprive her of her usefulness as a butter-producing animal. We have had experiments demonstrating that it doesn't hurt a cow very much to saw her horns off. If they could see the suffering I have seen they would think differently. I saw a brutal man take a rough, dull saw and saw right through the pith and marrow of the horn, and the shrinking, nervous creature was shaking as with a nervous chill. There is a way to deprive cows of their horns without much suffering. Take the young calf when it is about a week old, and you will see a little protuberance where the horn is starting. Take the hair off and apply a little caustic to it. It will smart for a little while, but it is soon over with; and it will stop the growth of the horn, and we will have what we used to denominate a "mooley." I do not see the utility of any horned beast being deprived of its horns. After a while the masterful ones will do as much damage in your herd as before. A man that will run colts and cows together ought to have them gored; he ought to be gored himself. When you have your cows dehorned you can never tell except, approximately the age of the animals.

Mr. Crooker. Is that not one of the advantages when a man has a lot of old cows he wants to sell? I am with Mrs. Busick; but I think there is more sentiment about this dehorning business than anything else. It does hurt for an instant. I have seen cows dehorned time and time again when you couldn't see any effects of it fifteen minutes afterwards. There would be no shrinkage of milk in two days.

Mrs. Busick. Was the milk as rich?

Mr. Crooker. Just as rich. If you would dehorn your cows you would change your mind about it. Mr. McClintock doesn't, and Mr. Hartley doesn't, and they take pride in keeping those horns on. I have dehorned registered Jerseys, and think they look pretty good. When I turn my cows out to drink they will drink as quietly as a lot of sheep would drink. I have a neighbor that had 60 head of cattle, and had his barn burned, and he turned them right into the shed. He couldn't have done it if they had had horns on. The weaker ones are apt to take their revenge. A year ago this writer went from here home, and there had been a very heavy rain storm and the water had run into my barn. I have a ground floor. I just turned my cattle into the shed, and I wouldn't have cared to do it if they had had their horns on. Wherever they have dehorned they are well-pleased with it. The cow needs a tail to fight the flies. I don't believe it hurts a cow to dehorn her.

Mr. Matteson. How many of you here to-day know that the blood and milk are all mixed up together until they get right to the udder? Do you want to eat milk and butter from a cow that has two miserable sores on her head for three or four weeks? There are more than 500 cows dehorned in my county. One veterinarian said to me, "I have such a nice way to do it that I have to have a boy to hold the cow's mouth shut to keep her from chewing her cud."

Would you use the milk from a cow with the lump jaw? Suppose you had a cow that had a great sore on her, would you use that milk? A sore on the base of the horn is twice as sore as a sore on the cow's jaw. I don't believe any man in this State or in the United States has a right to sell milk or the butter made from the milk while that sore is running. You can't find a cow above five years old in a dairy that has been dehorned. If you are letting down the bars so a man can beat us on this you are just as guilty as they are. I don't believe in it. Watch your cows when they all drink together. If I could take my choice I would rather be gored with the point of a pin than with a crowbar.

Mr. Phelps. For two or three years I have heard about this dehorning fad in the cow business. I keep cows for the money there is in them. It is no fun for me to keep cows except for the money there is in them. I have listened to arguments for and against dehorning, and I have never found a man that has dehorned his cows but what said it was a good thing. Men who have never tried it are opposed to it. Lots of men would not have ensilage on their farms because they have never used it. I believe, gentlemen farmers, that we must throw aside all this prejudice and get at bottom facts. In regard to dehorning—A neighbor of mine, an old lady, went out to feed some potato peelings to the cow. She stooped down and the cow raised her head, and the horn struck the woman in the eye. Then I thought to myself, "My cows' horns must come off." So the 12th day of December

I had occasion to go to the institute. I said to my boy, "If a man comes around let him take them off at the rate of ten cents a head." When I got home from the institute the first thing I saw was 26 head with the horns taken off. I said, "Are the cows doing well?" "Yes, two of them bled some." I said to him, "Did they shrink in the milk?" He said, "No, except one." The greatest curiosity of the whole thing was that they never shrunk in the butter. We make the butter into pound prints. That was another very remarkable thing. I tied these cows up in the stanchions. Each cow stands in her stall with the stanchion open. I couldn't do it with the horns on. But they stand there now just as quietly. In fifteen minutes some of those cows were chewing their cuds. I don't want the horns there; they are of no use to me. I am willing a man shall leave the horns on if he wants to. I don't want them at all. They were put there for a purpose, but we defend them now and they don't need them. I wouldn't have the horns on my herd for $50, to-day.

Mr. Matteson. I want to say here, if you want to take the horns off, take them off. In the advance of science and everything else they don't need them for a defense.

The idea that a cow is going to give more milk is just as foolish as my little joke about the chewing the cud. I do believe that in five years there won't be one cow dehorned where there are one hundred to-day.

Mrs. Busick. I was in an institute about four years ago when the dehorning craze was at its height in our country, and a gentleman got up and tried to prove that dehorning was right, by the Bible. You know that is the fashion; when an individual gets cornered he will try to prove his position by the Holy Scriptures. He tried to prove that dehorning was right, under the Old Dispensation. He said he had no means of finding out how they were dehorned. We read in Exodus like this: "If an ox gore a man or woman that they die; then the ox shall be surely stoned, and his flesh shall not be eaten; but the owner of the ox shall be quit. But if the ox were wont to push in time past, and it hath been testified to his owner, and he hath not kept him in, but that he hath killed a man or a woman, the ox shall be stoned, and his owner shall also be put to death."

I told him that the only way that I believed in dehorning was to cut the animals horns off right back of the ears.

Mr. Kelly. I believe with Mrs. Busick that dehorning should be done while the animals are calves. Men in our neighborhood who opposed it bitterly at first have had their herds dehorned and wouldn't have the horns back for a good deal of money. I feel safer in my barn with my cattle dehorned, but I don't like to dehorn cattle. But for Matteson to say that if the Almighty wanted us to have them that way he would have grown them so is nonsense. He might as well say he would give us a great majority of our animals already castrated.

The secretary explained the duties of the Intelligence Committee, and the competition for the premiums offered.

Discussion on Ensilage.

Mr. Phelps. I presume there is more spoiled ensilage in this vicinity than ever before. The past year has been an exceedingly dry one.

I don't know of any way to get at the right way of it only by experience. I have covered my silo with different kinds of covers, and this last year I didn't cover it at all. I am not satisfied with that. Next year I shall try another thing; and I believe after awhile I will get at the right side of it. I shall build around it, and as deep as possible, I don't care if it is 40 feet. I think I shall get through with a great deal less cost and with a better curing ensilage. We must have judgment in regard to the quality of the corn. It is only in its infancy yet to what it will be by and by. I would not know how to dairy without a silo.

Mr. Kelly. We haven't put on any cover for the last two years. Our ensilage was frosted, and that affected it a little. Down two or three feet at the edge there is a loss. There was a spot of a foot or two that was slightly burned. I don't doubt that was the reason. When filling it we weighted it down so it was packed down solidly and firmly. We have been bothered by rats getting in at the bottom. So this year we put in a cement bottom and plastered it up the sides three feet; and I have wondered since why it would not be a good idea to plaster the inside of the silo. We are not down to that part yet. I think it would be just about as cheap as anything. We have the best ensilage we ever had; and I think one reason is that it is tight at the bottom. The quality of the ensilage, with the exception of that burned spot, is the best we ever had. I don't know how we would get along without it.

Mr. Phelps. A man told me that a rat wouldn't eat ensilage, but I don't believe it, for when I was in Chicago the rats ate a box of Limburger cheese.

EVENING SESSION.

Question for discussion—"What is a woman's place in the dairy?"

President called on Matteson to open the discussion.

Mr. Matteson. I have been in a great many tight places in my life, but I think the president has now put me in a hole and sat down on it. The question was, "What is woman's place in the dairy?" If I were to go over into Ohio and live I would probably say it was her business to do the milking and take care of the cows. They all do it over there. There has been some missionary work done in the Western Reserve. A dairy cannot be successfully run without a woman in it. I never saw a man yet that could take dairy utensils and clean them up as a woman can. I tried to wash the dishes once and I told my wife she needn't worry, I could do it all right, and the next morning she wrote my name on a plate and handed it over to me. A woman should be an equal partner in every branch of business on the farm. In the dairy, if there is a silent partner in the matter it should be the man. I believe the most successful butter factories in our State are the ones where the butter is handled and the whole work is under the supervision of a lady. The best butter concern in the United States is managed by a lady. I would want to go somewhere dreadful quick if it wasn't for the ladies. They are the balance power of the whole country; and especially so in the private dairy busines of the United States. If there is a man here who hasn't got a lady at the head of his butter business I should advise him to get out a circular and advertise for one; and I will travel up and down the land and distribute them. A man is never half a man without a woman. I shouldn't consider the dairy worth anything without a woman at the head of it. When I talk about butter-making on the farm, again, I shall tell you how a man can spoil a woman's reputation for good butter-making. I am sometimes asked, "Who makes your butter?" I always say, "Mrs. Matteson. I furnish the material, and what little advice she is willing to take, and she does the fine work." A man that cannot be ruled by a woman when making fine butter ought to be an agent or something.

Mrs. Helen S. Johnson. What is the man's place in the dairy; and does he keep it? If it is the woman's right to clean up the utensils, and the man's right to furnish the utensils, who takes the profits?

Mr. Matteson. A woman is wronged when she is not allowed to boss the ranch. The way we do is this—when my wife wants anything I buy it for her or give her the money and let her buy it; and when I want anything I have to go and get trusted for it. She won't wear anything that isn't paid for, and I have to because we only make enough to clothe one of us; but I tell you my wife is an equal partner in the concern. But there is one thing that worries me. She is putting woman's rights onto me. She told me the other day to get her a new bonnet; and she said, "Now don't put it on the seat and sit down on it, or under the seat and push things against it." Now I think it is my right to buy me a new hat, but it isn't right for her to send me for a new bonnet. I got it, and had to hold it straight out at arm's length all the way home. A woman in the dairy business is a little different from one in the milliner business. In regard to washing the dairy utensils, if a man is the most cleanly in the matter he hed better do it; but at our house we are not built that way. I am sometimes requested to do a little more at my own toilet than I want to. A dairy without a woman in it is a one-horse concern.

Mr. Phelps. Does your wife go out and do the milking while you sit beside her and smoke a pipe?

Mr. Matteson. I never smoke on the farm, and I don't allow a man to. My wife has been Mrs. Matteson for 25 years. When she came to the farm she said, "You know I have always lived in the village, and do not know how to milk, and now I want to learn." I said "If you do I will get a divorce from you." It is not a woman's place in the stable. And that is one thing I have against the State of Ohio, the Western Reserve not excepted. The men take the butter and sell it and put the money in their pockets. I have found in this State a man's daughters out at the barn milking, and the old man at the house talking politics with a man that wanted to be supervisor. I pitied those girls. I don't believe it is necessary; and you had better reform if you are allowing your wives to do the milking. Why, it is such a pleasure for me to go into the house and see my wife at her work, and if she worked out with me or stayed in the house all day I wouldn't think half so much of her.

FOUNDATIONS FOR GOOD DAIRYING.

JOHN GOULD.

Seventeen years ago this winter I came to Meadville to attend a dairymen's convention; and the same subject concerns us now that we were discussing then—Does dairying pay? We have still kept our dairies; we have still milked our cows. There has been a sale for our butter and cheese; and I believe that this winter the dairyman is the only man that has any cash in his pocket. There are more dairymen than there were seventeen years ago, but dairying has not kept pace with the increase in population. Seventeen years ago we were shipping 100,000,000 pounds of butter abroad each year; and last year we did not ship one pound abroad for table use, and only $7,000,000 worth of cheese.

Now, sometimes before we go into an industry it is well for us to take a little invoice and see whether it is worth our attention to engage in it.

Last year we milked 14,500,000 cows for dairy purposes; and our statisticians tell us that we produced not far from $700,000,000, and have sold it and put the money into our pockets. The fact is, that while the other fellow has gone to the wall, and assignments are as thick as the leaves in the forest, no dairyman has failed, and no dairyman has had to turn his help into the street to become someone's charity. These questions we must consider for a moment, and see if there is not a good foundation on which to build the dairy. While other businesses have had their depression and have gone down to the bottom and struck sand, the dairy business has rode on the top waves. You will always observe that when prosperity attends other industries the dairyman prospers in proportion to it, and as a rule, a little above; and when the other fellow's bark goes down in the wave, the dairyman's bark does not dip water, and he very rarely strikes the shoals; and whilst there may be a temporary depression his bark is the one that rides into the harbor first of all. The dairymen scarcely knew there was a panic in 1893. It is the only industry that has tided its owners through this winter.

A man said to me the other day, "Hogs." I said, "Yes, and the hogs have been supported by the dairy; and some hogs that are being supported by the dairy don't have four feet. You want to take an inventory and know something about this. The man who is feeding his rations to his good cows is the only man who is turning the rations of his farm into dollars and cents, and getting pay for his rations. You say, "We feed it to the sheep." I was through Southern Ohio and saw sheep by the hundreds being bought and sold for 80 cents a head in the market. Some one says, "There is money in horses yet." Yes, there is. We have raised a class of horses that show a little speed, for our boys Sunday night. I want to say here to-night, in all sincerity that if we could sell off half our horses in our possession, and save the feed the horses will eat between this and spring, we should be just as much better off than we are to-day as the money they represent and the feed they eat. It seems as though we are doing a little bit of woodchuck farming. We gather in during the summer, and feed the stock in the winter that return us nothing for the food they consume. We feed steers that weigh from 150 to 200 pounds less in the spring than they did in the fall. We feed cows that do not return a profit for the food consumed; but we think that next spring when grass gets cheap we will make money in the dairy. We feed pigs that will go through the same hole next April that they went through last November. We have only added to our misery by keeping them through the winter. When it comes to a good cow, we are getting pay for every ration that she consumes for every day in the winter.

Sometimes we hear that there is danger of overdoing the dairy business. We have been trying for a hundred years to overdo the business. My grandfather told me that when he got six good cows, and took the butter to market, the neighbors told him he was going to break up the market. I think if we take an inventory of these things we shall find that our population has increased very rapidly, so that the butter and cheese that used to go to Europe doesn't go there now. We sent 240,000,000 pounds in 1870, and last year only 67,000,000 pounds. As we make butter and cheese better, we eat more of them in this country. In the year 1870 we only consumed 16 pounds of butter per capita in the United States. Last year the consumption of butter in this country was twenty-seven and a-half pounds, not counting the oleomargarine consumed. The better we make our material the greater the consumption of it. There is no economy in spreading good butter thin on bread; but when it comes to poor butter, a little bit of poor butter will go around a very big table. I don't believe there is very much poor butter made in Pennsylvania, but in Southern Ohio I saw carloads of it that wouldn't need any team to take it to market. All you had to do was to head it that way and it would go itself. And they couldn't imagine why I didn't eat any butter. I told them I could tell by the smell whether it was good butter or poor butter

Suppose every man, woman and child in this audience to-night would resolve that to-morrow morning they would begin to milk a dairy of 20 cows. We can resolve to become dairymen, but that resolution would not add one cow to the number in Pennsylvania. Resolutions don't put cows onto our farms. We have augmented our dairies in the past few years about 20 per cent. Each year we have done tremendously well in adding to the number of cows we have. While we add twenty per cent. to our dairies we find that ten per cent. of our old stock has disappeared. I don't think there is any use worrying for fear the cheese and butter business will be overdone. The city of London and the city of Liverpool each year buys $300,000,000 pounds of butter from the continent of Europe. Why don't we sell one-half of that butter? My neighbor came to see me the other day and I asked him what was the matter with his face, it looked so long. He said he had just lost $2,800. I asked him how he did that, and he said that a man had just wanted 700 barrels of apples at $4.00 a barrel, and he hadn't an apple to sell. They are asking for 700,000,000 pounds of butter over there, and we haven't a pound to send over.

The foundation of good dairying is the man himself, and his wife. A man and his wife are one. And I want to say one thing on Brother Matteson's account, and Mrs. Busick's. My wife and I put our money in the bank, and when we want to draw out some we take the bank book and get it.

Mr. Crooker. Why do you take the bank book?

Mr. Gould. It wouldn't do to take it in Meadville. You can draw just as much on your face as you can with a bank book.

The judgment with which a man administers his affairs is a guarantee of the indication of that man's success. It is a man's judgment expressed in deeds that tells what he is. No laws that the Legislature of Ohio can enact will make my cows give 5 per cent. more of butter fat. I must make my butter so nice that people will be tempted to give me 40 cents per pound. I must know how best to feed these cows to get the best results. And out of this judgment that I have comes the foundation of all good dairying.

We depreciate book farming very largely. And what is book farming? Simply some one who has read a good deal and collected the opinions and evidence of a good many different men and has condensed it into a little book. We read the experience of others, and out of this we get something that will fit our case. We add our own experience to that of others that is helpful to us and get success. We demand book learning of every other profession in the world. We don't go and get a back-wood's preacher when we want a minister. We must have a college man; a graduate of a theological seminary. We find a man that is competent and we hire him and pay him $1,000 a year; then we give him a donation. When some of your children get sick, and you say, "I think it is going to be a case of fever," do you send for a horse doctor? No, you want a man of large experience, and one that has gained all he can from the experience of others. But whenever you say to a farmer, "Be a book student," then they say, "Oh, he is a dude, and has his head towards the Legislature." We undertake to drag him down into the same rut we are in, and brand him as a "book farmer." I say to you to-day, if you are a dairyman read dairy literature, and get out in the clear light of dairy knowledge. While this dairy convention is a very valuable thing, it only meets once a year and covers a very small part of the area you want to cover. I think every dairyman should be a reader of dairy literature. It is a pretty good thing to know about your neighbor's business, providing it will benefit you. If there are forty dairymen in one neighborhood they can be benefited by coming together and talking over these matters. Let us not only get together but let us meet as a nice little club, and see if we cannot push on and do better than we have been doing; and each man stand shoulder to shoulder for a better purpose in dairy work. The definition in of good dairy is, a good dairy cow. What kind of cows have we? Are they dairy cows? Are they fed for the business we want them for, or are they simply general purpose cows? Have we given that cow dairy foods, or have we, in one sense, been trying to make a steer of her? With a good many dairymen it is pretty hard for them to tell from the profits made what sex of a dairy they are milking. It is pretty hard to tell whether it is profit or loss. A very few years ago we thought if a man fed his cow just as his neighbor did he would have just as good a dairy as his neighbor had. We find now that there must be a born dairy temperament behind the good cow in order to get the result we want. The world has become specialists. A man can run two or three specialties on the farm, but with each there must be a definite aim to get the desired result. Some men want a cow that is good for everything. Suppose we say to an agent, "I want a machine that I can put in my oats with, and cut my wheat, and dig my potatoes, and something that will pull stumps, too." If we have general purpose cows somebody certainly ought to invent a machine that we can do all our work with. What we want is to feed our cows for a purpose. No cow can be a long, continuous milker that has beef mixed up with her so that she fats easily. We must breed for the thing we want. Somebody says, "You want us to buy a lot of John McClintock's little Jerseys." No, I didn't come here to tell you that; but the best performing cow has the specific dairy points. We must remember that the dairy temperament is bred into them and not fed into them. We must understand that the cow that gives two pounds of butter a day has it born in her. We must learn these things and stay by the dairy and the dairy farm, and let the fellow out west raise the beef. When we get the two mixed then we say that the dairy doesn't pay. No trotting horse ever improved by adding Clydesdale blood to it? Never in the world. So no dairy cow was ever improved by bringing in things that are against the production of milk. We pick up the dairy papers and we read about albuminous matter and nitrogenous matter, and so they go on through, and we are just as wise when we get through reading as we were when we began. We want a balanced ration. We find in corn stalks the starch necessary, and in oats the albuminous matter. It is very fortunate that when Nature planned out America she gave us the corn crop. The stalk is worth more than the ear. The stalk contains just the same material, and it is easier digested. Oats are too costly to feed a dairy cow. Oats and peas make the albuminous matter and nitrogen; and now that we have learned how to raise peas and the oats, we get this balanced ration. So about the best dairyman to-day is the man who comes nearest feeding his cows on oats, peas and corn, and puts the fertility back to raise succeeding crops with. A crop is worth just what it costs to raise it.

Last winter I stood in the mills in Waseca, in Minnesota. I saw mill feed in carloads. Between there and West Aurora I pay somebody $12.00. There are about 500 pounds of cob dust in each ton of the bran. Those cobs are shovelled into the mill and ground fine, and then sifted, for fear the dust of a cob would be found in the meal. Next year we will have the thing so that with our oats and peas we will be independent of the fellows out west. What can be done there can be done in northwestern Pennsylvania.

Now, as to the character of the cow. I want to say that a cow is a dairy cow simply because she is a mother and furnishes a certain amount of milk to her little offspring. Sometimes we send the calf to the place where they make pressed chicken and sell it for fifty cents a pound, and we take the calf's place at the side of the mother, and call that dairying. We simply take the nutriment intended for the calf and make it into human food. The man that can best understand the cow from the motherhood side is the man who shall best succeed as a dairyman. A man's wife is always the best dairyman of the two, simply because it is one mother understanding and knowing the wants and needs of another mother, which she can do much better than any man can. We dairymen will be a great deal better off when we get a little more femininity injected into us than so much masculinity. I want my cow kept warm, I want her free from chilling drafts and drenching rains and drifting snows. I want her comfortable in every way. We want more improvements in our barns. In too many of our barns the cow is made to fit the stable rather than the stable to fit the cow. A cow must be kept warm and comfortable twenty four hours in the day in order to get the best results. When we get our barns so they are comfortable then we shall reap our reward. To-day I was pleased to hear Mrs. Busick come down on the stanchions. I don't believe in stanchions. The Goulds have been down on stanchions ever since the days of Quaker witch-craft. I wish sometimes that I could ask a cow what her opinion of the dairyman is when he advocates stanchions. We would have a radical change right away in some of our practices if the cow could tell us what she thinks.

Our dairying is rapidly drifting towards winter dairying. We shall have the best results when we introduce the element of succulence into our foods. Take the lawn mower some day next June when the clippings are nice in the front yard and mow 100 pounds of those clippings. Your cow will in twenty-four hours get on the outside of it. She will give from that two pails of milk, and there will be eleven pounds of spring water in it, and in a week your cow will be practically dry. I am not arguing now for ensilage. I think that in localities where our dairy is large enough to pay we should have co-operative dairying. I believe much of the work of winter dairying can be better done, as a rule, at the co-operative factory. I don't believe in building $5,000 creameries that are not worth over $500. I don't mean to take a speculation in it at all. I want to take out of fifty homes in this neighborhood the work of making butter, which at least reaches the market fifty different kinds of butter. We can start cheaper co-operatively than each man can do in his own home. Twenty-five dollars each from fifty men will take this hard work out of the home. I said this the other day at an institute, and a little Dutchman got up and asked me what the old woman would do if she didn't have to churn and take care of the butter. I said to him, "I don't know how it is with you, but I think at the average farm house that women could be relieved of that four hours' work and still find something to do that might be more congenial; she could put some of those hours into something that would make the home happier."

This question of the foundation of good dairying is a very practical one. We get interested in it, and we get enthusiastic over it, and that makes our work lighter. At one of our institutes the question came up, "What is drudgery in farming?" One man got up and said, "I can tell you what drudgery in farming is. It is doing a thing you don't know anything about, and then trusting to luck for success."

When we begin to know something of the cow's character and her wants, then we are ready to begin to build up our great industry. Then we, too, shall become enthusiastic over it, and the great dairy industry of the United States shall get brighter and better, and it will pay the men better who engage in it, and we shall say at last, "I am glad I became a dairyman."

Music.—Beethoven quartette.

Discussion.

Mr. Burwell. What do you think about exercising a cow in the winter time?

Mr. Gould. We don't do it. A man that doesn't turn his cows out in the winter time must have a barn in which the surroundings are pretty nearly as pleasant as summer time. His barn must be thoroughly ventilated and he must give his cows as nearly as possible summer food. When you do these things I don't know anything the cows need exercise for. Unless you can give your cows good air, and plenty of it, then it becomes necessary to give them some fresh air in some way. I am opposed to stables that a cow has to be turned out of to be comfortable. We aim at turning all our food into milk. I came home two weeks ago, and if you remember, three weeks ago we had almost summer weather in the middle of the week for several days. My hired man said, "I have it learned." He said, "I have learned to keep the cows out of the barn." But it took me two days to get them back to their regular mess of milk a day. Make them comfortable if you want the best results.

A Member. I would like to have Mr. Gould explain how to admit fresh air without admitting too much.

Mr. Gould. Our stable is the whole of the barn. I have no use for a basement barn for a cow in the winter. I want my barn built with more windows than this hall has. Instead of having the ventilators at the top, have them within six inches of the floor and draw off the foul air, and then you have a warm stable with pure air in it. Use lots of absorbents. One of the chief troubles is that we do not use absorbents and deodorizers. Use horse manure as an absorbent and road dust as a deordorizer. Then you will not be greeted with any of the foul odors that now greet your nostrils when going into the cow stable. Sawdust is not as good as horse manure as a deordorizer. I don't want any sawdust in the manure.

Mr. Matteson. Why don't you put plaster in the place of road dust?

Mr. Gould. I do, but I don't see that it is any better.

Mr. Matteson. I had a fellow come up and make a ration for me one time. He showed me by a chemical analysis just what we had better do, and I put it right into the laboratory (the old cow's stomach) and the two didn't agree, and I will take the old cow's evidence every time. I won't scrape around in the road for dust either. I would rather go down to the station and haul up a load or two of plaster. I don't like sawdust, either. I don't like to plow sawdust land. It may not have any effect on your soils here, but it does damage our soils there. We used to pay fifty cents a load for sawdust, and within the last two years fellows had to hire men to haul it away. I agree with Mr. Gould all along the line, except in one thing. John said that the good wife got so tired turning the crank to the churn.

Mr. Gould. If you turn the crank then your wife has two cranks instead of one to manage.

Mr. Matterson. While Mr. Gould and I are striving to attain the same thing, we don't agree along all the lines, and we have agreed to not disagree; but while John has said here to-night that it must be winter dairying, I say we must make it whenever the people want the butter. I went into Cornell. There were thirty-nine young men and women there taking a course of twelve weeks to learn to make butter and cheese. A young man up in one of our New York counties took a course at Cornell, and came home and took charge of the dairying. They cannot make butter enough for the trade. That boy knows something, and is making the kind of butter that the people want. He has brain cultivation. In Ostego county, N. Y., they wanted to know how to begin to build up their industry. They were all acquaintances of mine, in fact the most of them had gone to school to me. I said, "Start what you call farmers' clubs here. Get up discussions, and after a little while get your butter all together and have a trial of it." They said, "Will you come over as one of the judges?" I said, "Certainly." The trial came in June, and I went over. They had thirteen samples of butter there. Only two were off a little. We told them where they failed. They have been working right along together in that club, but there is a remarkable change. They have the same cows, they have the same wives, and they are the same men, and they have reaped the harvest of good prices together. I went into a screw factory in Providence some years ago. I saw the process of screw making from beginning to end, and when it was finished it was just as rusty as ever. "Now," I said, "the hardest part of this work is coming." I supposed they worked it on an emery wheel. He said that was the easiest part of the whole thing. They had immense cylinders, and they poured those screws right in there and every one rubber every other one bright. That is what ails the farmers to-day. They have the stuff in them, but they need to get out among their neighbors more, and have farmers' clubs, and every kind of clubs, except the ones where your head is so big when you get up in the morning. Have a club where you can take your wife along. And don't believe that it won't pay to give your boy a college education. The more he knows the better off he will be as a farmer. Why, almost anybody can preach. About all they have to do is to go around and talk to the dear brethren; and all a physician has to do is to look in your mouth, and the coroner will set on you in a few days, and the doctor's wife will have a sealskin sack every other year. The quack will agree with you and will let you be sick in just whatever line you say. Almost any man can be a lawyer. I can't; I can't lie. I am not built that way. But when it comes to farming it takes some brains to do it; and there isn't a man on earth who ought to be prouder of his work than the farmer. Farming is the very foundation of all the nations of the earth. Just now everybody is setting down on us, but we are just proving to them that we are the foundation. (Applause.) When the banks failed, I said, "Let them bust! We haven't any money but we have lots in the cellar." Young ladies, marry a farmer if he will have you. I mean if you like him. That is my advice to you. Never disparage knowledge. Knowledge is power; and it is a power that can never be taken away from you in the world. We stand at the top of the heap, and we are the most independent men on the earth to-day. I hope you are all farmers here. I am afraid somebody will go out if you are not. I do enjoy seeing the boys branch out for themselves. Don't bear down too hard on the boys. They have progressive ideas. Let them elaborate them. Take home every word John Gould said. He hit me. He said my wife had to ask me for money. My wife reads a good deal. She read about a fellow over in Ohio that went with his wife to town to help her carry the bank book, and one day she went alone with the bank book, and that wife never came back.

Mr. Phelps. The question was in regard to absorbents. I kind of imagine that the farmers here to-day want genuine information. I will say that in regard to absorbents I don't think there is anything better as a deodorizer than road dust. I had used swamp muck for an absorbent. Of course horse manure is all right if you have it. I mean by swamp muck, vegetable mould. I don't mean black earth. I mean something that will burn right up when it is dry.

It is a good fertilizer, as it is, and a great deal better after it has been used as an absorbent. Try road dust. Try it every place—hog pen, cow stable, in the drain around your house—and let us know the result next year. I should use swamp muck as an absorbent if it is managed right. You will be astonished at what a lot you can draw at one load, it is so light.

I believe the time is coming when the farmers of this country will dairy the year 'round. I wish I took the selfish view of it that Brother Matteson has, because he is making summer butter, and all the rest of us are making summer butter. We milk the cows in the summer time when we are having lightning and thunder storms, and the flies are worst, instead of making our butter in the winter when the price is highest. We ought to let them go dry in the summer when the prices are low and we are busy with our harvest. It takes a good deal of thought and system to get these things in operation, but when you get there you are right on top of the business and will make some money out of it.

Mr. Matteson. Can you make a pound of butter in January as cheaply as you can in June?

Mr. Phelps. I think I can; but not with as fine a flavor.

Mr. Matteson. I haven't used a pound of ice about my dairy in ten years. I have very cold water. I know many have not, but I am the one among ten thousand, and altogether lovely. I must be at home in the summer anyway to do my harvesting, and if I don't have to milk I should work myself to death. I must be stopped at five o'clock with something. I do it as self-preservation. You make butter ten months in the year. You stop in July or August. I stop in March.

Mr. Phelps. Do you know what it costs to keep a cow in the summer, or to make butter?

Mr. Matteson. I don't believe any man living can tell you what a pound of butter costs.

Mr. Crooker. You say it costs much more to make butter in January and February than in July and August. It costs you more to keep a cow in January if you are not milking her than it does in July or August. If we do not milk them through the winter we do not get anything for their keeping. It takes more acres, on an average, to keep a cow in the summer than it does in the winter.

Mr. Matteson. I never yet have found a man that was making that wonderful amount of butter in the winter, but what he piled the grain in if he had silos of the best quality. He must throw in the grain. We don't keep one cow to the acre. During the winter the cow is recuperating her strength and getting ready for the next season. There is money in it. Ask John Gould how much money he made when he kept a cow dry six weeks, when he fed just as much as when she was giving milk.

Adjourned.

THURSDAY MORNING.

Opened at 9.45 A. M.

Mr. H. C. Crawford. "What is the Matter With Us?" (Paper.)

SALT.

R. P. BEATTY, *of Cleveland, Ohio.*

Through the courtesy of your committee I have been invited to address the convention on the subject of salt.

I have an idea that one would have to be a wizard in the use of words to make anything out of such a subject—common, every-day salt—and therefore I shall not make the attempt, but will endeavor to overcome the prosiness of the subject by the injection of some facts that may prove interesting.

Salt is mentioned in the Scriptures in many places. I will mention a few. The faithful are admonished in Lev. LL, 13, "And every oblation of thy meat offering shalt thou season with salt." Gen XIX, 16, Lot's wife. In Luke XIV, 34, we are told that "Salt is good," and in Collossians IV, 6, we read, "Let your speech be always with grace, seasoned with salt."

During my limited investigation of the subject I find that other old writers than those of the Bible looked upon salt as a very important factor in the economy of nature, and it seems strange that an article that cuts such an important figure with mankind as salt is so little known. Much has been learned about salt, but it ever has, and unless we obtain stronger evidence than we now possess, ever will remain a geological problem.

There are many diverse opinions as to the original formation oi rock salt. I suppose that it may be safely assumed that it occurred in the primary foundation of the earth's crust, and that it is held in small quantities in all waters running through these formations, and is in this manner collected in the oceans and seas. The ocean water contains two and one-half per cent. of salt at the poles, while at the equator it contains four per cent. This is easily accounted for by the greater evaporation at the tropics, and is an exemplification of the statement that salt is not volatile except at great heat. This is further illustrated in that, during the geological evolution of the earth upheavals have cut off portions of the ocean from the remainder—the Dead Sea, for example—this water yields 26 per cent. of salt; its surface is now much lower than its former main, the Mediterranean, or any water known, and much stronger. Rock salt varies in its degree of purity with location. The purest found is at Weiliezka in Galacia, Austria. The next in purity is from report of government expert at Petit Anse, La.

The salt at Weiliczka is quarried out just as we quarry stone—in blocks—and much of it is marketed in that form, but, where the rock lies too far from the surface for mining (as is the case with most American rock) wells are sunk, the rock flooded, and the brine so obtained is brought to the surface. It is then placed in pans and heated. The first formation is a thin film of salt on the surface; a puff of steam goes off, and then crystals form and fall rapidly. They are then raked from the bottom of the pan to a platform to drain; then dried, bottled, packed, ready for shipment.

It is lamentably true that, until recently, the quality of the American salt manufactured has been very poor, and such as to justify the criticism of the foreign (older) manufacturers, that America produces no pure salt; but, happily, our manufacturers have come to a realization that we want the best, and were willing to pay a price commensurate with quality. The greatest trouble encountered by the salt manufacturers is the vexing and injurious chlorides of lime and magnesium found (with one exception) in all salt that we have any knowledge of; and his aim is to get rid of them.

You will no doubt be surprised to learn that as much salt enters into the manufacture of chewing tobacco as is used in butter. Recently in conversation with a large manufacturer of Middletown, O., I was told by him that the one element that enters and injures his goods, and over which he had no control, was the lime and magnesium chloride found in salt. His is the experience of Liggott & Myers of St. Louis. Many butter and cheese makers tell me the same thing. The superintendent of a large Chicago packing concern told me, a few weeks since, that the lime in salt caused his company much loss of meat each summer. Here, are the obstructionists to the perfect action of salt, for salt in itself is sweetening, while the chlorides usually found with it are bitter, and neutralize it.

I will read an extract from the United States Dispensatory, which can be found in any drug store, page 1,383, bearing on this point: "When pure it (salt) undergoes no change in the air, but when contaminated with chloride of magnesium, which not infrequently happens, it is deliquescent. This deliquescence is what causes the alternation of absorption and drying out of moisture, and consequent hardening, a supposed necessary peculiarity of salt. The presence of either or both chlorides in salt is very easily determined. Permit me to again read from the Dispensatory, same page: "An aqueous solution of the salt showed yielded no precipitate or cloudiness on the addition of the test solution of sodium carbonate (alkaline earths) or Borium chlorides (sulphates) or hydrosulphuric acid or sulphide of ammonia (metals.)" Anyone can make these tests, and thus place himself in a position to know exactly what quality he is using. Pure salt will make an absolutely colorless brine; but it by no means follows that a salt giving such a brine is pure; as a matter of fact, salts showing a perfectly clear brine need close examination, because, while they may be free from that which causes the cloudy brine, gypsum, they may not be free from the dangerous chlorides.

Get of any druggist one quarter of an ounce of ammonium oxalate, to which add four ounces of distilled water. This gives the test for lime. For magnesium, get an ounce of sodium carbonate and dissolve in thre ounces of distilled water, warmed. Five drops in a wine glass of brine will detect lime or magnesium, making separate tests for each.

There are many diverse opinions as to the desirability of salt as food, or to its being necessary to the human system. Physiologists tell us that extensive observation proves that, to persons living on a mixed or vegetable diet, salt is essential. On the other hand, history tells us of many savage tribes who, living on animal food, never use salt.

Chemistry tells us that both chlorine and sodium, which form salt, exist in animal food in sufficient quantity for those who live entirely upon it. Such is not the case with vegetables. The observant physician will tell you that where disease exists salt is deficient, and that patients never object to it, but on the contrary, relish it. Unquestionably, the office that salt performs in the assimilation of nourishment, is an important one, and, necessary or not, it certainly is a most savory condiment.

Perhaps it may be interesting to know the number of barrels of salt consumed yearly; and that we may be able to compare our work with the foreign. I have selected the years 1881 and 1891:

	1881.	1891.	
Manufactured,	5,961,059	9,987,945	In. 68 per cent.
Imported,....	1,473,000	535,800	De. 64 per cent.
	7,434,059	10,523,745	In. 42 per cent.

The English manufacturer tells us that the supply of salt in the United States is inconsiderable; these figures hardly bear him out.

I trust that I have shaped my subject into a form possessing some elements of interest, and I thank you for your attention.

R. P. BEATTY,
United Salt Co.,
Cleveland, O.

Discussion.

Question. Did I not understand you to say that the little specks in the butter are sometimes caused by impure milk?

Mr. Beatty. Yes sir.

Mr. Matteson. I am glad I came here. I would willingly come here to have the matter settled as to what makes the specks in the butter. We have them in the butter before we put the salt in. It must come in what the cow eats. I never have any specks in my butter.

Mr. Gould. I think it is the skim milk we have been feeding over and over.

Mr. Lavery. I would like to ask in regard to the sampling of salt.

Answer. In sampling salt, phosphate, milk, or anything, a great deal depends on the sample taker. Before answering the question I will draw your attention to what I said. I gave you certain tests by which you can demonstrate the character of the salt you are using, without reference to any brand. I don't care who makes the salt. You can tell whether you are using a lime salt or not. You can tell whether you are using a magnesium salt. These samples (referring to those on the table before him) were all taken out of stock. The sample of Genesee salt was taken out of a bag that I got at the store. The sample of Worcester salt is from the same source. You can find Genesee salt in this town in any of the grocery stores. You can find all the salts I have used in the same way. I stand ready to have you send out and get any or all of the salts and leave it to any chemist in this town as to the correctness or fallacy of what I have been telling you about salt.

Mr. Matteson. That Genesee salt I know is all right because it came from New York. Everything that comes from there is all right.

Mr. Lavery. Are the two prices charged by different individuals any criterion by which to judge the quality of salt?

Mr. Beatty. I don't see, nor can I understand, how a salt pure from magnesium and lime can be sold at anything like what I hear some of the members of this convention say they buy their salt for—$1.00 a barrel. The way salt is made is simply by the process of evaporation. It can be sold to you for a dollar, and the manufacturer can make money at it; but when he attempts to make a fairly pure salt, he must double up on price. I presume that, all things being equal, the price is, in a measure, a guarantee as to the quality of the goods.

Mr. Smith. Are not these samples of salt sufficiently pure to salt butter with?

Mr. Beatty. I should think that the purest of them would be sufficiently pure to salt butter with. I don't know that you can have anything purer than something perfectly and chemically pure.

Mr. Heydrick. Where do you obtain the water to make the tests?

Mr. Beatty. I got it at the drug store. I had the bottle filled with distilled water. Rain water is not chemically pure, but it will answer the purpose.

Mr. Lavery. Last summer I salted two packages of butter with different brands of salt; one cost more than twice as much as the other. I sent both to Chicago, and they found no difference in the salt in either package. That is why I asked why the price of the salt has anything to do with the quality of it.

Mr. Beatty. It is fair to assume that if one of these ladies were going to make a cake, she would take the best flour she knew of; she would take the best butter she could find; and the best of everything she could find; and in order to get the best possible results it is fair to assume that she will take the best possible ingredients. It is fair to assume that if you are going to make the best butter you will take the best salt you can procure.

Mr. Root. Have you made any test with the Ashton salt?

Mr. Beatty. The Ashton, is, in my judgment, the purest salt that comes from the other side. It will not compare in purity with the Renowned. It will compare in purity with any other salt made in America. The Diamond Crystal is the best American salt. The Ashton will not compare in purity with the Renowned.

Mr. L. C. Magaw. I met with a loss of $400 one season on account of the quality of the salt I used. Prof. Arnold told me the best salt to use was the Genesee; he was pretty sure. I said, "How can I make the test?" He said to procure some fruit jars. I did so; and the professor mixed the salt with water. Among those salts was one I got from Michigan. The man I bought of recommended it highly. That salt was the cause of the funeral of a number of hundred pounds of cheese. There was a sediment in the bottom of the Michigan salt that was of a slippery nature. With the Ashton salt it was perfectly pure. I believe the salts made in the United States are fully equal to the salts made in foreign countries, and we as Americans ought to make use of them.

BABCOCK TEST.

BY MRS. BUSICK.

11.00 A. M. to 11.30.

Mrs. Busick. If the women of to-day who have all the fancy ailments, would go out on the dairy farms it would add fifteen years to their natural life. A woman must have exercise, just as a dairy cow must have exercise. I don't believe in either one of them being shut up twenty-four hours at a time in a warm house or a warm stable. Any variation in the quantity of your acid—either too little or too great—will make a marked difference in the weighing of your butter fat. As soon as the milk is placed in the bottle and your acid is placed in the milk, it should be shaken up before you proceed to fill the next bottle. The reason is obvious. If you let the acid remain there in the bottom of the milk the heat from the acid will coagulate the lower strata of the milk, and the result will be that when you come to read the percentage of your butter fat you will find it collected and filled with black specks, the casein having been burned by the acid that was not thoroughly incorporated as soon as the milk was placed in contact with it. The unison of the milk and the acid generates an intense heat. So, when I am at home, taking tests in my own dairy, I fill the lower part of this receptacle about one-half full of boiling water before I begin to turn the crank. That insures immunity from broken test bottles, a thing that frequently happens in cold weather if you stop the crank when the surrounding temperature is in any degree colder than the ordinary temperature of the milk. After having thoroughly incorporated the acid and the milk by turning the crank three minutes, you then fill up with hot water in each of these bottles until the butter fat rises to the top, and then all you have to do is to read off the percentage of butter fat. There are some kinds of milk that it takes a good glass to see the percentage. The temperature of the milk is quite an important feature. It should be as near the animal heat at which it was drawn from the cow as possible.

Question. Can the acid be too strong or too weak?

Mrs. Busick. Yes, sir. I generally aim to have the acid of an exact strength, and for that you have to depend largely upon the dealer. It is to the interest of the parties furnishing the acids to have the tests made as authentic and accurate as possible. Eighty per cent. of butter fat is what is generally considered a correct amount for 100 pounds of butter, and the balance will be casein and the different acids, as well as the amount of salt and water. Eighty per cent. butter fat, and 12 per cent. of water, with the balance the different acids that enter into the formation of butter, make the 100 per cent.

Mr. Smith. I would like to have someone tell me about what per cent. of butter fat a profitable dairy cow should give.

Mrs. Busick. It is as hard to tell what per cent. of butter fat a good dairy cow ought to give as it is to tell "who struck Billy Patterson." It depends on the feed, care and management; and there is no cast-iron rule by which you can determine what the per cent. of butter fat must be. At different stages of lactation she will vary with different surroundings and care. But the object of the Babcock test is to find out what cow will give such an amount of butter fat according to the amount of milk given, as will pay. I wouldn't keep a cow that will not make 4 per cent., and she must give a pretty good mess of milk in addition to that.

Mr. Matteson. The average cow in the United States will hardly come up to 3 per cent.

Mrs. Busick. I wouldn't want to milk six gallons to get the same amount of butter fat that I can get from a cow that gives one gallon; and it only takes one-sixth of the time to milk her.

Mr. Magaw. I have tested a great deal of milk that gives but little over 2 per cent. I consider it the fault of the patron—not the fault of the cow.

Mr. Matteson. There comes in a point for the Babcock test. All this time the creamery business has been paying a premium on poor milk. It is folly ever to pool milk.

At the conclusion of the Babcock test Mrs. Busick said: "Give me the little cow that will turn all her food into butter fat, aside from the small amount of milk, and I will take her every time in preference to the great, overgrown cow that you must pile the food into like you would the coal into the furnace of an engine to keep her running.

Mr. Phelps. I have a cow that will not weigh over 700 pounds. She tests three per cent. fat. Gives 45 pounds of milk a day. I prefer her to a larger cow.

Mrs. Busick. I would prefer a heavier milker. If I were running a butter dairy I would prefer a little cow that only gives two and a-half gallons a day, to a cow that gives four or five gallons. Besides the energy that is used, you save time, and "time is money" in this world. The result of the test is: No. 1, 3 per cent butter fat. This is a test from ordinary dairy milk, as it is delivered to customers in this city. No. 2, 4 and 4-10 per cent. butter fat. No. 3, 5 per cent. butter fat. No. 6, 6 and 1-10 per cent. butter fat. This is from a registered Jersey. Her dam was recently sold to Miller & Sibley, and is now in their herd. No. 5, 6 and 2-5 per cent. butter fat. No. 4, 5 and 3-5 per cent. butter fat. I don't know who furnished this milk; with this exception, that three of them were from Jerseys. The other three had no mark by which I could tell the breed of the cow. You will perceive that the Jerseys, in their production of butter fat, are away in advance of the ordinary cows that are used in dairies of those selling milk. In making the test the velocity has something to do with the raising of the butter fat. I began with 45 or 50 and increased the speed to 80. Eighty revolutions to the minute are the best figures for those who turn the crank.

Adjourned until 1.45.

Songs by Miss Peacor and Mr. Betts.

OUR HOMES IN THE NEAR FUTURE.

By HELEN S. JOHNSON, *Corry, Pa.*

It has been said that mother, home, and Heaven, are the three sweetest words in the English language. Be that as it may, the world is full of precious words and grand thoughts and noble deeds. Life is broad, comprehensive, and complex. Yet all the interests of human life center in the home. It is the centre and circumference of our existence. It is for the betterment of our homes and their inmates that all these questions of dairying and farming are being discussed here, and every question of public or private policy should be weighed as to its relation to the homes of the nation. Not of our individual homes, or the homes of the few, or some particular class; for human consciousness has risen until we begin to realize there is nothing but is something to us. As the poet has so graphically pictured it:

It is nothing to me," the young man said;
In his eye was a flash of scorn and pride;
"I heed not the dreadful things you tell
I can rule myself, I know full well."

But,
'Twas something to him when in prison he lay
The victim of drink, life ebbing away,
As he thought of his wretched child and wife,
And the mournful wreck of his wasted life.

"It is nothing to me," the beauty said,
With a careless toss of her pretty head,
The man is a wreck if he can't refrain
From the cup you say is fraught with pain.

But,
It was something to her in after years,
When her eyes were full of burning tears,
And she watched in lonely grief and dread,
And started to hear a staggering tread.

"It is nothing to me," the mother said;
"I have no fear that my boy will tread
The downward path of sin and shame
And crush my heart and darken his name."

But,
It was something to her when that only son
From the path of right was early won,
And, madly cast in the flowing bowl,
A ruined body and sin wrecked soul.

"It is nothing to me," the merchant said,
As over the ledger he bent his head,
I am busy to-day with tare and tret,
And have no time to froth and fret.

But,
It was something to him when over the wire
A message came from a funeral pyre
An incompetent conductor had wrecked a train
And his wife and child were among the slain.

"It is nothing to me," the voter said,
"The party's loss is my greatest dread,"
Then gave his vote fcr the money power
Tho' homes were crushed and paupers made;

But,
It was something to him in after life
When his daughter became a laborer's wife,
And her hungry children cried for bread,
And could only hope for comfort when they were dead.

And today human invention has almost abolished time and space, and bound the whole world together by electricities, and in the great Ferris Wheel of life, the family that is up, this generation, is apt to be down, the next; so it becomes the imperative duty of even those who believe that charity begins at home, and never goes beyond it, to have a care for all the homes of the nation. And we as farmers who are most directly interested in the farm homes, should always remember that our homes are affected by the conditions of other homes; and the only safe way—to say nothing of the only just way, is to see that fair opportunities and good conditions, so far as possible, surround all, for from whence cometh or whither goeth the evil we have carefully guarded our particular homes from, we little know. To-day we are standing with bated breath, looking at America's homes in the past and present, and peering with anxious eyes into the future, saying, what shall they be? The homes of the past we could not if we would, duplicate—and we wouldn't if we could. Our loved Whittier has told us that—

"All the good the past hath had
Remains to make our own time glad,
Our common daily life divine,
And every land a Palestine."

And we of to-day feel that the results of the heroism, the fortitude, the sacrifice, the labors, the achievements, the inventions of our ancestors, are our rightful heritage, the heritage of every American citizen. And so, while determined to cherish and emulate their virtues, and retain the blessings of their homes, we are just as anxious to share in the improvements of the present. We remember that it was for us that the Pilgrims landed on New England's "rock-bound shore." It was for us that the Declaration of Independence and the Constitution of the United States were wrought out and fought out and engrafted through self sacrifice and bloodshed as a part of, yet, the very heart of this nation; and its "equal rights for all, special privileges for none," should be as sacredly guarded as the birthright of every child of this Republic, instead of, as today, ruthlessly trampled under foot for the benefit of the few, and the oppression of the many. Existing conditions press themselves upon us, and we are obliged to pause to look upon America's homes today, over a century later, blest with more natural advantages than any other country ever possessed. A land broad and wide, where the sun never sets, bounded by nature's great reservoirs of protection, purity and strength; filled to overflowing with everything necessary for man's needs and comfort—a world of our own where we might dwell in peace and plenty. But is such the case? After an era of progress such as the world never witnessed; with a nation of educated citizens, and where inventions have multiplied, wealth increased, until the lowest conditions among us, should be better than the best an hundred years ago. We are confronted on every hand with spectacles that strike terror and consternation to every honest, thinking soul. We find our government run solely in the interest of the few (and the most of those few foreigners) and in open defiance of the wishes of the people. Our Supreme Courts packed with men who sell themselves to the highest bidder and justice has become but a by-word and farce in this nation where men are sent to insane asylums for telling the truth and hunted worse than ever the fugitive slaves were, for daring to be true to their convictions where hunger and starvation are gnawing at the vitals of millions of citizens of a land blessed with a bounteous harvest, deadly, pinching, freezing cold in a country where the supply of fuel is almost inexhaustible. Homelessness in a land that has offered homes to the homeless of all nations. Not a city in this great land but where this terrible condition exists. This question is so serious, so far reaching in its results, we must pause to consider it. Is it those who will not work, and therefore should not eat, that are in this condition? Nay, nay, 'tis the "working classes" that are suffering. No want among the habitually idle, they live as well, go to Europe as often, their dogs are as well cared for as ever. It's the producers of wealth that are suffering for the necessities of life. It isn't necessary here to picture the homes of millions of industrious American citizens. If you haven't caught glimpses of them, you have certainly read plenty of descriptions of them. The official report of New York City in 1891, which shows that in that city alone, in that one year, twenty-seven thousand families were evicted from their homes, while in the whole of Ireland, in the same year, there were only about five thousand evictions, and yet we Americans talk about poor Ireland. Oh, in America today, we have many, many homes destitute of all that makes life worth the living, and that crushes all the manhood and womanhood or childhood out of their inmates, and breeds disease, insanity, and crime from which our homes have to suffer; and then in our ignorance we cry out against the dispensation of Providence. And now let us turn our attention to the farm homes of the present. Those "Forts of the Nation," are they increasing in value as the wealth of the nation increases; are the mortgages, those "evidences of prosperity," beautifying them and increasing their fertility and adding to the happiness of the inmates, by giving them better opportunities, as great blessings should? Again I am compelled to say that unpainted buildings, dilapidated fences, and run-down farms greet us everywhere in the wealthiest agricultural countries, as well as in the poorest. And when we look for causes, for our farmers and their families are an industrious, economical class, and although they live better than their ancestors did fifty years or an hundred years ago, still they do not live in excess of or equal to the ratio in the increase of wealth which they have helped to produce, or the inventions which certainly should make life pleasanter and easier for all. We find, on turning to our nation's statistics, those great educators—that we are becoming a nation of tenants and landlords; a condition hard to make American farmers believe desirable, though political demagogues should say and reiterate it times without number. New York has about 40,000 tenant farmers, Pennsylvania 45,000, Illinois 80,000, and very many of the farms owned by foreigners, while in the cities a still smaller share of the people own their own homes. So in examining our homes in the near future, how pictures present themselves; one we would gladly thrust aside, but it will not down; its shadow is everywhere, its shiny trail can be traced over continents, its poisonous breath reaches us from densely populated cities where immense wealth accumulates, in manufacturing towns where great wealth is produced, at the county seats where the centralization of wealth begins, in the mining districts where hard, unpleasant, unhealthy toil doesn't obtain even the necessaries of life for the toiler, and is spreading out into evry district in the land, cursing those it touches, and those who cause it, the innocent and the guilty. A contaminating influence that penetrates every strata of society, demoralizing in all its effects. Dire poverty, the lack of employment, the inability of the laborer to retain enough of the products of his labor to support himself and family in comfort, the injust legislation which is robbing the farmer, not only of the products of his toil, but is stealing his home away from him (for sneer at the fact as some do, it is demonstratable that class legislation is taking the money out of the producer's pockets and putting it into the usurer's pockets) the insecurity of real wealth and the high value placed upon money or ficticious wealth is destroying the once happy, prosperous homes of this country, and destroying the honor, the integrity, the virtue of the present generation. The remark "every man has his price," and the evidence that the greater share of them have, is simply appalling. And as we turn away from the view of the homes that seems imminent of one palace to a thousand hovels. We turn to catch a glimpse of our homes in the near future under different conditions, conditions which great-hearted, noble-souled men and women are giving their lives to bring about, for dark as the outlook is, today, there are plenty of men who cannot be bought with a price, plenty of people who are willing to sacrifice their own happiness and comfort to secure the greatest good to the greatest number, realizing that in blessing others comes the surest blessing. Never were there so many good people in the world, never so many thinking good thoughts, doing noble, unselfish deeds; never was general intelligence so great or thought so active; never were such gigantic problems so ready for solution, never before were the truly good of all classes, all faiths so ready to clasp hands and unite their powers for the uplifting of all humanity; never was the battle between right and wrong so fierce; yet never did right stand such a grand chance for succeeding. And so we catch another glimpse of our future homes. It is almost two thousand years since the blessed Christ came saying, "Another law give I unto you that ye love one another." My friends, haven't we professed it long enough to begin to live it? Let us turn on the search light of human love and wisdom, and see if it does not correspond with the Divine command of, "Do unto others as you would others should do unto you." Let us square every stone that enters into the homes of the future by the rule, and reject all that does not stand the test. It is possible we have groped our way up through the night of human selfishness and greed, and dark and dreary has been the way and great the sacrifice for not obeying His commands; but the light is breaking. "We are climbing up the steps of time, and this old world is growing brighter;" every problem that has been puzzling man, has found solution, and today are only waiting application. And these United States of America are surely a fitting place to build first the happy, healthful homes of the near future, from whence shall come noble men and women, with perfect bodies, pure minds, and loving hearts; grand souls, worthy images of Him who heralded "Peace on Earth, Good Will to Men!" Men and women so constituted it will be perfectly natural for them to do right, with no desire to do wrong; for where there is "Nothing that maketh a lie," there will be no lying. When there is plenty for all within easy reach, no need of stealing. When we work for love of good instead of love of gain, and money has lost its powers, becomes again merely a medium of exchange; when we shall cease to convert the golden grain meant to sustain life through unwholesome processes into that which poisons the body, inflames the mind, and converts man into an uncontrollable fiend; when we cease to allow our food to be adulterated with unhealthy substances that make sickness the rule, instead of the exception. When we are again willing to work for the greatest good to the greatest number, and that number includes all. When we understand that if we wrong another, we do a greater injustice to ourselves. When we are willing to lay down all our prejudices and preconceived motives, realizing that the "Truth shall make us free," and search for the true, nay in every line of thought, delving into nature's store-house for her ever beautiful lessons that always lead us aright, believing,

"The human life in us all is one.
And a sweet and sacred thing,
And the one great God is the lover of all,
The Father of all, and King;
And the broad green earth He made for us all,
As well as the beautiful sky,
And He meant that we shall be happy here
As well as when we die.

But, do you wish something more definite? Shall we spend a little time in planning and beginning those homes now? Then let us first take an inventory of stock and see if we have everything needed for them, for we want them to be as nearly perfect as it is possible for us to make them. The foundation comes first—American soil is good enough, and we have plenty of it, no need of crowding, the homes may be as large as we need (and we shouldn't wish for larger), the streets as broad as you please, and as much room for play grounds as is desirable, for in this age the electric and steam railway, the telegraph and telephone, make all crowding unnecessary. How thankful we should be that, crowded tenement houses and dark, unhealthy alleys, breeding and spreading disease, have no longer any reason for existence. Having the site we only need the material and labor, and that we have in great abundance. American mines and American forests, American workshops and American labor, can supply enough of those to build a comfortable home for every citizen. We need not be bothered for a medium of exchange, for our constitution provides that Congress shall provide that for us by placing the Government stamp upon some convenient material sufficient for our needs. As there is nothing wanting in the three factors—land, material, and labor, that goes to build homes, let us build them well, beautiful and convenient. We have seen a beautiful white city spring into existence this last year, a city, with its palaces and streets, its government police and fire departments, its amusements, its industries. A city beautiful and costly, without poverty or crime, with all the complex machinery which goes with dense population, but without its crime. Let us take it for an object lesson, remembering that, what man has done, man can do," and if it is possible to build one perfect city, it is possible to build all cities perfect. As there is no need for crowding, so there is no cause for isolation. We have been struggling for centuries to grasp the "Fatherhood of God and the Brotherhood of man," we have caught glimpses of it down through the ages; and wherever put in practice, it has shed blessings on humanity and helped us higher in the scale of civilization, (yet we are doing things, today, in our civilized country, that the beasts would not do). They have been fragmentary religious societies, political movements, fraternal organizations, every generation some new idea has crystallized and become a living factor in the present civilization. The free school system, which has become such an important part of our nation, that we scarcely realize what a wonderful thing it is, nor how much it has done to make our nation great. And our postal system, how much that has done to bless our homes! Mothers, how could we let our children go out into the wide world, if it were not for that sure and swift method of transmitting our thoughts. We little realize what a world of love is carried daily through the United States' mails; and yet how noiselessly, swiftly, and perfectly it is done! No other business in the United States, perhaps in the world, is to be compared with it. And so, in one way and another have we grasped the principles, made them practicable, and by years of commercial test proven them a success. So, in building our homes in the future, there is no reason why every factor that carries blessings on its wings, should not be utilized to its fullest extent, and every evil suppressed. Let us pause a moment to drink in the grandeur, the blessedness of the home. All the homes of the nation, beautiful, clean, warm, well ventilated, well furnished, supplied with every convenience (for there is labor and material sufficient) none too close, none too far apart, all connected by railways, telephones, and telegraph; all supplied with free mail delivery; all heated and lighted and supplied with water by the best appliances. We can afford that too—for the best can be supplied in large quantities cheaper than the poorest in small quantities. We have plenty of examples of that; look at your work-house in Allegheny—and surely it isn't necessary for us to become criminals to have good things cheap. A noted Divine on visiting an Orphan Asylum and noticing how well cared for the children were, how perfect the sanitary conditions were—that the food was both palatable and healthful—such splendid opportunities were given mind, soul and body for development, how experienced teachers watched them during their hours of recreation as well as the hours of study, how every evil trait was restrained and every good one cultivated, how their talents were noted and every facility given them for improvement; and when upon inquiry found it cost less per capita to raise them in the best possible manner than it did in families in the poorest manner, that they were better provided for than the middle class, and were better brought up than the wealthiest who are so often ruined by pampering and overindulgence and a cultivation of their worst traits, for it is almost impossible for us to see our children as they really are, the first thought that came to him was, how much better it would be for the children and the world if all parents would try and give their children a fair chance. Then he was ashamed of the thought, although he didn't want to think it; it just thought itself, and he wished all parents would co-operate to bring up their children in the best possible manner. Of course, we have tried it in a limited manner in the schools, but, but a small portion of a child's time is spent in school. Of course all homes should be within easy reach of good schools, churches, lecture halls, and pure entertainments; in fact, everything that makes human life better or happier. And the same power that furnishes the good can suppress the evil. As money would have lost its power only as a medium of exchange we shouldn't have to license evil to secure money; mothers, we shan't be told then, as now, to keep our children at home if we don't want them ruined. I often wonder why our city streets are such unsafe places (and we know they are); they are under the full control of State, National, and Municipal Government, and they are expensive affairs. But the dwellings are but part of the home. Oh, what beautiful farms we will have then, we shall live so well and want so much they will have to be well cultivated, all model farm or experiment stations! No noxious weeds to annoy the thrifty husbandman, for the good of all will eradicate those; no waste places or unhealthy marshes, that will settle the Forestry question, "tis for the good of the country' and in this new government of the people, by the people, and for people, what is best must be dône. And how horticulture will flourish, no unripe fruit on the market then! And what gardens of flowers! Their incense shall rise on all sides to sweeten and bless our lives. And we'll raise less hades and less pigs. But do you ask me what will become of the doctors and lawyers and constables and police courts, etc., etc.? Well, I confess I think there will some of them be like some of our statesmen, 'out of a job,' but we will find them work. We will follow the Biblical injunction, "He that will not work shall not loaf," unless incapacitated; but there shall be work for all. Our works always increase with our means, and the best physicians will be kept busy teaching us how to keep well and how to grow better bodies, and perfecting sanitary conditions. Our best statesmen and lawyers devising ways and means to add to the prosperity and happiness of the nation, and the rest can do the work the children are doing. We'll have no child slavery then; and when, as has been the case this summer, some honored guest comes to see us and we bring out the school children and march them before them and say, "we honor you with the best we have," it will be with pride, indeed, and no poor, ragged, half-furnished child shall peer out from some corner to throw the lie at our civilization. Are you wondering about the women that grace those homes, the free-born wife, sister, and mother who are perfect equals in all respects to the father, husband nnd brother? Picture to yourself the noblest, truest, sweetest, most loving woman your fancy can picture, It will then fall short of describing the homekeepers in the New Nation. And the men (?) well they won't all have black eyes, or blue; but their faces will bear some resemblance to the pictured face of that most perfect of all men, Jesus of Nazareth. "Thy kingdom come," is breathed by millions of souls,

And humble though the suppliants be,
And cycling time unceasing rolls;
Though distant seems that gladsome day;
Yet wait we, Lord, on thee.
Some earnest hearts presage the good is nigh
And Heaven worketh in the under mass.
Oh twist the bands! Divine one at the cry
Of surging waves, and let these days, of evil quickly pass.
Thy kingdom come! Oh wondrous words!
What mean we as we pray there day by day?
Doth aught of their divinest import speak,
Or, do we tell them off as parrots may?
Great Father! help us that we strive with reverent mind,
To comprehend more clearly what thy Son hath taught.
Give us an inspiration swift and keen,
Broad, deep, and strong, with purpose fraught.

Song by Mr. Betts.

THE ? IN BUTTERMAKING.

By Mrs. KATE BUSICK.

This may seem a queer starting point to many of you, but as all things must have a beginning, albeit, like a great many controversies apparently without end, we have selected it upon which to base a few practical suggestions: What is butter? When was butter first made? Why is butter made? Where is butter made? How is butter made? Which and, by whom is the best butter made? To treat of each of these topics exhaustively would far exceed the limits assigned to this paper, so I have selected a few of the most salient points and endeavored to show why "there is always room at the top for excellence in every branch of life's pursuits, butter-making among the rest. The ? is at the foundation of forms the base of all progressive action.

Did it ever occur to you that man of all created beings, is the only animal that even asks a question, or to all human observation even formulates one in his own mind? To a very great extent the higher intelligences among the lower animals evince a certain degree of reasoning capability, from "cause to effect;" yet they now indicate the reverse mode of reasoning from "effect to cause." This is the sole prerogative of man and by it alone he holds his proud position as "lord of creation." Take for example our most intelligent domestic animals, the horse and the dog. They easily learn to associate certain movements and requirements with certain commands, and their obedience is either commensurate with their love for their Master, or fear of punishment and were it not for this simple unquestioning, blind obedience, man with all his vaunted superiority over the animal kingdom would never be able to control or direct a single individual of the inferior orders; because questioning raises opposition and leads to controversy—controversy engenders theories, elicits new facts, enlarges the scope of argument, broadens and widens the field of observation and adds new stores of knowledge to already existing facts; and in the end antagonizes the different ideas advanced, ranges the opposing parties into pros. and cons. and marshals the contending supporters of each under the leadership of their respective champions. The facts comprised in our first interrogatory come appropriately under the head of what, and the question naturally takes shape thus—What constitutes butter? It is an animal production usually derived from the milk of a cow. Webster defines it as "an oily unctuous substance obtained from milk by churning." This is a glittering generality, as misleading as generalities very often are, because it would be just as applicable in a sense to oleo-margarine, sometimes denominated "hog butter," as to real butter. Any one who has stood at a corner grocery on a hot summer's day, as I have frequently done, and witnessed the contributions of cow grease, I cannot dignify them by the term butter, will not be surprised when I affirm there are many kinds, that, like the "human form divine," merit the description of being fearfully and awfully made. There is the "cheesy" article so destitute of color it looked as if it was made from the skim milk of a white cow—the oily, smeary smudge, somewhat resembling castor oil in a congealed state, and just about as vile smelling and tasting, the "ring-streaked," the "speckled," "spotted" and "dappled," like Jacob's cattle mentioned of old, and finally the sort denominated by Bill Nye as "bald-headed butter," because it has so few hairs in it. There should not be so much diversity, for the chemical constituents of butter are always the same, varying only in their several proportions according to the quality of the article; these are oleine, stearine, margarine, butyrine, caproine and caprint, the three latter in very small quantities and mainly contributing the odor. It is not necessary for me to enlarge upon these several kinds of butter that find their way to market. You've all doubtless seen them, the grocer knows them by sight as well as smell, and also knows pretty generally who makes them, and the housekeeper is acquainted with them likewise. The quaint old English proverb has it, "There is one good wife in the country and every man thinks he hath her." I would paraphrase this and say there are some good butter makers in the country and every grocer knows them. Here let me digress to say that it is a burning shame that first-class butter makers should suffer as they do, for the stupidity and incompetency, to say nothing of the dirt and carelessness of the slovenly butter makers; and yet I've known farmer's wives, who made a first-class, gilt-edge A No. 1 butter, forced to take the same price for their choice product, as the greasy, streaked, nasty, rancid mass received, only because as the grocer explained, "they were neighbors and it would never do to pay the one party more than the other, because it would offend a good customer and they couldn't afford to lose their trade; and so the careful, painstaking butter maker was compelled by this means to pay a premium on the shiftlessness (to call it by no stronger name) of her neighbor in this making and selling an inferior article, or else travel over the adjacent towns to find private customers who were willing to pay a fairly remunerative price for her superior commodity. I submit that this is an outrage, and loudly calls for some sort of modification. Butter, like every other article of merchandise should be sold upon its merits alone, regardless of who made it. Farmers submit to have their wheat, corn, oats, hogs, etc., graded and why should butter be exempt? Poultry dealers too are beginning to discriminate in fowls, and there is a movement on foot to regulate (not the hens) but the size of the eggs sold, in fixing this valuation by weight, the selling of eggs by numbers instead of weight has always been an imposition upon the buyer, and with the introduction of improved breeds and larger eggs, an imposition on the farmers and poultry raiser as well. But as this matter does not strictly come within the limits of my subject, although butter and eggs are usually almost inseperably considered, will pass to the consideration of the second? When was butter first made or introduced as an article of food? The oldest mention of butter in profane history is by Herodotus the Father of History in his account of the Scythians, a roving, pastoral as well as warlike people, about 450 years B. C. It is spoken of in the Book of Job nearly 1,200 years earlier, though recent authorities favor the translation in the passage as "oil" instead of butter. It was not commonly known as an article of food among the ancients down to the second century of the Christian era, but mainly used as a medicament in ointments for various mechanical purposes. Even Galen, who has been honored with the title of "Father of Medicine," gravely recommends its use "as an 'unguent' and for the besmearing of leather and rendering the tanned skins of animals more pliable." Could he have looked with prophetic gaze down the sixteen centuries that have intervened between then and now, and seen much of the stuff that passes under the name of butter, he would most likely have declared "it's all the use the stuff is fit for." The early Romans and Greeks preferred the sweet oil of the olive, and to this day the nations of Southern Europe mainly use this oil to the exclusion of every thing else in the shape of butter; still, among the pastoral peoples of early civilization, butter found a place among the table luxuries of the rich and affluent, and just in proportion as an enlightened and refined state of society obtains at the present day, in that same proportion does it take its place as one of the necessities of the household. Why (?) does butter become a necessity? If you will permit me, I will in thought you back to the primitive habits and customs of the aborgines. In the rude days when mankind dwelt in huts and caves, or tents fashioned of the skins of animals taken in the chase, hunting and fishing were the main sources of subsistence; their wants were few and easily supplied—they existed but did not live in the full meaning of the term. Content to enjoy the trophies won by bow or spear, they gorged to repletion when the hunt was successful and bore the pangs of hunger and starvation in stolid silence when their efforts resulted in failure. With no ambitions, save perhaps to excel in their rude sports and savage warfare, they were content, "to think the same things that their fathers had thought. To do the same deeds that their fathers had wrought." With what result? The same unvarying monotony from generation to generation—such as characterizes the working of the swarm of bees today—did ages ago and will do cycles of time to come. By and by the crooked little interrogation point? Standing for why? and wherefore? began an agitation in the minds of some of the more thoughtful, and a desire for something higher and better began to stir in their hearts. Little by little innovations crept in at first, and almost imperceptibly; but the ages wore on, and by dint of inquiry and answer, experiment and effort, the savage had become civilized and the arts and sciences had their birth and being. The spirit of progress linked with human effort wrought unceasingly, until civilization became enlightment, and enlightment bore fruit in Christianity; and as these successive stages were reached, the needs of mankind became more varied and multiform, and that which sufficed for the luxuries of a past generation, became the absolute necessities of the generation succeeding. When our ancestors first deposed the barbarians and made Great Britain their home, they found the natives living much as I have indicated, in caves or rude stone huts, without the knowledge of metals, their only cutting implements flint stones or sharp shells; but the spirit of inquiry was born and with strange unrest led them ever onward, outward, upward, and the never ceasing question, Why? still led them like Alexander of old seeking new worlds to conquer. In our own land the pioneers that were content to sit down to the coarse and homely fare of bacon, hominy and potatoes (and God bless them!) paved the way, for all that we enjoy, but they have given place to a generation that knows nothing of the hardships they endured, save as it is recounted in song or story; and to the cultivated and refined tastes of the present day, a table that is spread lacking butter lacks one of the most essential adjuncts of the meal. But these changes were not wrought in a day or a year. The coral reefs around which crystallize the isles of the ocean, are formed by myriads of insects, too minute to be seen by the unaided human eye, working silently but continuously; so the ages in their noisless progress have from day to day and year to year evolved the flower of christianized civilization and refinement from the barbaric stock of ancient heathendom. Incessant change is the order of life, since the sun never sets upon the same conditions he witnessed at rising. Like the vast, unseen, imponderable forces of nature, "never hasting, never resting," the thought of man is continually seeking new channels of industry, sounding deeper depths or climbing higher heights; and this is why all the pursuits of agriculture as well as the ventures of commerce and the improvements and inventions of manufacture must and do keep pace with the advance of thought in science and art to be pushed to the wall; and this is where "the survival of the fittest" comes into our every day life and occupations. From the oily, unctious compound, evolved in a great skin bag on the back of a rough paced camel, or a jolting donkey, a long series of years and refining influences have perfected the beautiful golden butter of the present day, although in the interior of Mexico the donkey driver and his goatskin filled with milk still perform the offices of churn and dairy maid, yet it must be confessed the resulting compound, though it passes under the name of butter, is not the cleanest or most delicately flavored specimen, such as would suit the taste of an epicure, nor would it compare at all favorably with the product of a first-class dairy cow of 1894 in Pennsylvania, manipulated by a first-class dairy man or woman. This brings us to the fourth (?) Where is butter made? In Europe the leading butter making countries are Denmark, Sweden and Norway, Holland, England, Ireland, with the provinces of Normandy and Brittainy, in France and Switzerland. Russia makes some butter, but not in sufficient quantity for export. Of the countries named, Denmark leads, both as regards quantity and quality, Danish butter having long been considered the choicest production of the continent, owing to the extreme care as well as perfect cleanliness observed in every stage of its manufacture. Dairy schools are established in different parts of the country under Government patronage, where the farmers' daughters can be sent to receive instruction in all the branches of dairying and intricacies of butter making. They are taught in a systematic maner, how to care for as well as feed and milk the cows, each girl being given the custody and management of two cows. The stables are kept scrupulously clean, each animal is carded and brushed twice daily, the milking, watering, and feeding done at regular and stated times, the whole feed is weighed and given in exact proportions, each animal receiving just what its needs demand and no more; no loud or boisterous talking is permitted, nor is a blow ever given; the girl who cannot manage her cows with gentle firmness is at once sent home as incompetent, every milking is weighed, tested, and recorded, so that the superintendent has but to glance over the pages of the dairy register, to know just what each cow is doing. A certain standard of ability is adopted and every cow that fails, after a specified length of time to come up to the standard prescribed, is sent to the butchers' block. Just as much care is exercised in the dairy room—in the setting of the milk, the skimming and ripening of the cream and the churning, salting, and working of the butter. In this way each girl receives a thorough practical education (supplemented by lectures every week) in dairying and butter making in every detail, from the care and rearing of the new born calf, up to the packing of the finished dairy products for the markets of the world; and it is to Danish ingenuity and patient research, that we are indebted for the cream separators, that are now so largely used on some of our most extensive dairy farms. Perhaps some one may say, what is the use of all this, since not one in a hundred will ever have all "the appliances or even the opportunities of butter making upon any but the smallest scale and with the most primitive methods?" I answer to this, that when we send our boys and girls to colleges and universities, it is not with the understanding that when they return to us from graduation they will expect to set up a college or university of their own. We send them to receive that mental training that will fit them to engage in the life pursuits that they have a talent or aptitude for; and that will enable them to successfully cope with the difficulties that are sure to confront every one who engages earnestly in any active pursuit. Human life is said to consist of three things—time, talent, and activity—either wanting, the other two are useless, so the thoroughly instructed butter maker goes back to her home, armed most fully at all points with the necessary knowledge that will enable her to more successfully utilize the means, limited though they may be within her reach, than if she had remained in entire ignorance of the best methods by which to obtain these results. Of course we have no such training schools in this country, but I am most wonderfully impressed with the growing interest manifested among our farming communities by the holding of these institutes, which are in themselves a liberal education, and the activity and energy displayed in the same. A free interchange of opinions as to different methods and modes of operation in the way of improved tillage of the soil, as well as improvement in the care and feeding of stock, will prove a wonderful educator as well as provoke a spirit of emulation and good natured rivalry as to who shall excel in the different branches of husbandry and stock raising; and this introduces the next(?) in my subject. How is butter made? I will not enter into the details of creamery butter or the manner in which it is made in a regular dairy, but content myself with treating it as a farm product; and I might start out with the broad statement that every farmer keeps one or more cows, but on too many farms, butter making is only an accidental adjunct of the farm, by this I mean, that instead of being considered as one of the regular and legitimate branches of farming and a source of profit, it is looked upon as a side issue, a kind of necessary drudging, not to be dispensed with and yet ignored and neglected as far as possible, and as it is conducted on a great many farms it is a disagreeable drudgery. Let me illustrate: Take a farmer who never stables his cows, to his shame be it said, but freezes them in a stock field day by day and shelters them on the zero side of a straw stack or rail fence at night, giving them a few nubbins of corn night and morning and that grudgingly; he gets but a couple of quarts of thin, blue, milk, from the shivering hungry creatures, while his wife has no conveniences for setting even this miserable product—sometimes the milk freezes, when of course the cream product is still smaller and after perhaps a weeks' careful hoarding of cream, the old back breaking dasher churn is brought into requisition and the long agony of churning begins—its thump, thump, chug, chug, splash, splash often for hours at a time, is no doubt a familiar sound to many of you, until tired nature gives way and the weary wife or daughter feels as if she never wanted to hear tell of butter—and still the butter wont come. In sheer desperation she dashes into the churn a lot of hot or cold water, as she thinks the exigencies of the case may require, and maybe after repeated aplications of both cold and hot she will be rewarded with a mass of white, spongy, cheesy looking stuff, that no more resembles genuine butter than the curd at a cheese factory. She salts, works and sets it away with a sigh of relief that the dreaded weekly churning is done. What does that butter represent to her? A money value? Visions of nice little comforts that it may buy? Not a bit of it. It stands for nothing but unpaid drudgery. If the family do not eat it all up before next churning day comes around, it, with the remains of former churnings is stored up until the men folks go to town again and then taken to the grocer, who reluctantly gives 10 cents or a shilling a pound in trade for it, said trade consisting many times of a couple of pounds of cheap brown sugar and a little coffee, and the balance—"Well I guess I'll take that in terbacker," and the vile, filthy smelling black weed is weighed out and pocketed with a grunt of satisfaction, while perhaps on the same day the poor forlorn cows were kicked a curse by their irate owner because they don't make their salt, and the grocer is at the same time inwardly imprecating the farmer's luckless wife for making and sending such stuff to town. Now who is to blame for such a state of affairs, and wherein lies the remedy? I believe it is more the result of want of thought than anything else. I do not believe, as a rule men mean to be unkind, neglectful or cruel to those who are dependent upon them—they are only inconsiderate, thoughtless, or careless, and if they can only be brought to see that it does pay to treat and care humanely for stock as well as wife and children self interest if no higher motive will prompt them to do better.

Song by Miss Peacor.

OUR DAIRY SCHOOL.

PROF. H. P. GURLER, *State College.*

In the dairy course of six weeks, the first thing in the morning is instruction by Caldwell or Waters on Dairy Breeds, or Dairy Herd Management. The second thing is one hour by Caldwell or myself on Creamery Bookkeeping and Scoring Butter. In the line of bookkeeping we have made the class debtors to the creamery. We are running that work just as we are supposed to run a creamery. At the end of the month we are going to figure up and pay off the patrons just as you would in actual creamery practice. In the butter scoring we score two samples every morning. The class is composed nearly or altogether of young men, although some of them are past forty. Nearly all of them have positions secured before going there. They are interested in the work. They are much interested in the scoring, and are taking hold of the work grandly. I tell them sometimes I feel almost too much responsibility myself. This hour takes up until 10 o'clock. From ten until twelve comes the churning. In this line comes the cream ripening; testing for acid. This test for acid is made by taking a fixed amount—50 c. c., of cream. We can actually measure the amount of acid in the cream. The object of this is that we need a certain amount of acid to develop the flavor. We don't want too much acid—too much destroys the flavor, and puts the cream in such a condition that we lose in the churning. There is many an old butter maker that has known for years that when the cream became too sour the butter loses in the yield. Many of us thought the acid destroyed the fat. I thought that until I used the Babcock Test. There is one valuable point that we owe to the acid test. In the hot summer weather we fail because we have too much acid. We are unable to control the conditions, and the cream becomes too sour, and the acid test will tell us when it has become too sour. It will help us to take our test. A man may guess at it, but it is hard to determine anything unless you have something to determine with. You need a gauge to teach you when you have reached the proper point. After months and years of practice, a person's taste becomes educated. Now the ripening process—we have ripened our cream at a temperature of 70 degrees. Some of the time we have used a starter, and sometimes we have not. It is not very much of a cream-producing section in the vicinity of the college, and teams are sent out to secure what milk we use aside from the college farm. This cream we set at a temperature of 70 degrees. We ffundertake to hold the temperature of the room at the same degree; and the cream is churned the following forenoon about 10 o'clock. We hardly get acid enough in our cream by that time; hardly as much as we would like to get, but we want to churn, and we don't want to set the cream at a higher temperature than 70 degrees. We may possibly go a little beyond that, but it is dangerous to go much beyond it. When cream is ripened at 80 degrees the aroma is destroyed. The temperature of churning depends upon the amount of fat in the cream. We have churned milk there this term with all the way from 20 to 40 per cent. of fat in it. Forty per cent. of fat is very rich cream. The standard at the World's Fair was Forty per cent. fat. We sometimes put water in it. I don't agree with the lady on the question of putting in water; but we all have our views. I shall allow her hers. We have had our cream so thick that we had to put in some water so that we could churn it. I find that the temperature at which it is possible to churn depends upon the amount of fat in the cream. We take cream with 15 to 20 per cent. of fat in it and it is hard to get that butter to gather below a temperature of 58 degrees. I can take cream with 30 to 35 per cent. of fat in it, and can get the butter to gather at a temperature of 55. We have had butter gather in the churn at 45 degrees. Once or twice we have had it above 58 per cent. in our work this winter. You may ask why we churn it at this low temperature. There are two reasons for it—you get more exhaustive churning, and you leave less fat in the buttermilk. Experience has proved this. We have had this in practice for the last year in all our creameries, and the longer we go in that way the more we become satisfied that it is the right way. You get less fat in your buttermilk, and you get better butter. You make a butter with less of the foreign elements in it. To illustrate, you may take two churnings of butter—one gathered at 62 and the other at 54. Wash them both as long as the water is colored. You put that butter that was churned at 62 onto the worker, add the salt to it, and go to working it, and the water will show milky. Take the one that was churned at 54 and treat the same and the water will be perfectly clean. That shows that we have removed some of the foreign elements from the butter. It is an advantage. If I were buying butter to hold in cold storage I would not buy that churned at a high temperature. Butter churned at a low temperature keeps better than that churned at a high temperature. We are giving the class tests of milk. We take samples of milk and expose them to some foul odor. One day we took a sample and put it in the silo, and then took it to the class. We did this to show them how readily milk will absorb odors. When this sample was brought before the class, one young man who had just come from the silo said he didn't know whether it was the milk or himself. We took a sample of milk to the calf barn. The class readily knew where it had been exposed. We do this to show them how quickly milk absorbs bad odors. In that line it is not only milk, but cream; and the butter and salt will absorb bad odors. I have had butter give us serious trouble from the salt being exposed to bad odors. One day we had severe trouble with butter that had been contaminated in the salt room.

At another time we had a sample of milk that had been contaminated, and when we inquired we discovered that the shed where they hitched their horses adjoined the creamery. By the time the butter got to New York it was away off flavor. Our churning and printing is done in the forenoon. We finish at 12 o'clock. At 1 o'clock we get together again, and weigh the milk that is to be separated in the afternoon. In this work we have in the morning a sample of the buttermilk taken in the afternoon, and a sample of the whole milk and skimmed milk; and we have these points to talk about in the afternoon discussion, from 3.30 to 5 o'clock. In that way we keep up an interest in the work, and have the discussions while the work is all fresh in the minds of the class. We bring up anything that has occurred in the day that has interested the class in this line. We are not only testing this milk with the Babcock test but we are having it tested with the gravometric. That is, our skimmed milk and buttermilk. I had twelve tests of skimmed milk that averaged with the Babcock test .063; these same samples with the gravometric averaged .095. That is less than one-tenth of the fat left in the skimmed milk for the average of twelve days. This is the standard method of testing. I have had samples of buttermilk that the average test of five days with the Babcock test was .07; the average of the five days with the gravometric was .138. This work we feel reasonably well satisfied with. In the churning line we have done things that we knew were not just right. Did it purposely in that way to show how not to do it. For instance, one day I purposely allowed the churn to be stopped a little before collecting the butter. We found four-tenths per cent. of fat in it. The class were much more fully convinced on that point than they would have been for me to have simply told them how that might happen. We have also purposely blundered in the amount that we churned the butter. We let it be gathered up in the large globules. You butter makers know what that means. After you have it gathered too much you cannot wash it to amount to anything. I do think that washing helps to remove the flavor we are working for. When we can churn at an extremely low temperature we can get along safely without the washing. If your butter gathers too warm I believe that a little washing helps it. We have, as a rule, washed the butter at the dairy school. I don't wish to be understood as being opposed to washing butter; because I am satisfied that there are a great many creameries where the conditions are such in hot weather that they would get into trouble. But I would say to remove the water just as quickly as possible. The salt would assist in removing the foreign elements from the butter. With the same quality of cream you would have to churn longer. It is not practicable to churn cream with a low per cent. of fat in it at this low temperature. I know you cannot churn the cream with a low per cent. of fat in it at a low temperature.

Mrs. Busick. Is more butter recovered at a low temperature than at a higher?

Prof. Gurler. Yes, ma'am.

Mrs. Busick. Our cream was always churned at 62 in summer and 68 in winter; and then since I have been using the Babcock test I find that we recover within a very small fraction of 1 per cent. of butter fat in the cream.

Prof. Gurler. This is not theory; it is a hard fact. I cannot give you the reason. Why it is I cannot tell you. I have fourteen days work in one of our creameries. The average of the fourteen days work was 1-10 of one per cent.

Mrs. Busick. I am only asking the reason why; when we have to churn longer or use greater power because a number of us use the concave churn, and we have to use greater power to produce butter from cream at a low temperature than at a higher.

Prof. Gurler. Yes, you will.

Mrs. Busick. In one of those power churns, when you stop the churn after the butter has come, the temperature of the cream has risen from two degrees to six degrees. What is the temperature of the atmosphere in the room where you do this work?

Prof. Gurler. That varies. I have found that you may start the churn in a room at a temperature of 45 degrees, the temperature of the room must be 15 degrees colder than the cream in the churn. If the temperature is 15 or 20 degrees higher than the temperature of the cream you will get into trouble.

Mrs. Busick. Do you have any method of finding out just at what particular juncture the butter globules break away from the cream?

butter that will squat on the plate when it gets hot, but the Jersey butter will stand up and look you in the eye, and the sweat will run right off it. That is what makes the Jersey butter take in the market.

Mr. Caldwell. That is very true of the Jersey butter, but the question is whether the Jersey cow will not make the butter so solid in the winter that you can't spread it on your bread.

Mr. Matteson. When you can't spread it you can eat it in chunks, and that makes the demand greater.

Mr. Lavery. When the butter is lacking in flavor it is lacking in one of the most essential elements in the market. I have no objection to the Jersey cow, but give her credit for just what belongs to her. Give her credit for solidity, and the others for the flavor.

Mr. Gurler. It will not do to ripen at 70 and cool at 55. Hold it at 55 until the fats solidify.

Mr. Gould. Isn't it a fact that the cow has very little to do with the flavor of the butter?

Mr. Gurler. I would go back to the feed.

Mr. Gould. Can you tell the difference in the feed when you have put it through the butter extractor?

Mr. Gurler. You can tell the difference between well cured clover and ripened hay. Early cut and well cured hay will give a flavor to the butter. We must have acid to make the flavor. They must get together.

Mr. Lavery. Why cannot we attend and feed a cow that has been giving milk for six months and make as fine flavored butter as a fresh cow?

Mr. Gould. I think that if you take that and aerate it, and then raise the cream, and put in the lactic acid, that neither you nor any other man can tell when that cow came in.

Mrs. Busick. The two breeds, Jersey and Guernsey, are almost identical. One from the island of Guernsey and the other from Jersey, and within a very short distance from each other. The only difference that you can tell is that the Guernsey is spotted, usually. There is about the same difference between them that is between tweedle-dee and tweedle-dum.

Mr. Caldwell. The profitable dairy cow is determined by her make-up. Then take her and handle her to get the most out of her.

Mr. Lavery. People have been led to believe that the Shorthorns fell below in the test.

Mr. Caldwell. In the cheese test the best Shorthorn was No. 5, when compared according to the rules. When the other things are taken into consideration the Shorthorn fell to No. 16.

Adjourned at 4.30.

Resolution offered by A. L. Wales.

Called to order at 7.30. The following preamble and resolutions were offered by Mr. Wales, and adopted by the Pennsylvania State Dairymen's Association:

WHEREAS, The Secretary of Agriculture has omitted from his estimates for the next fiscal year, the appropriation for the agricultural experimental stations of the United States, which has hitherto formed a regular item of the agricultural appropriation bill, on the ground that said appropriation is not, as the law now stands, a legitimate charge against the Department of Agriculture; therefore,

Resolved, That we, the State Dairymen's Association of Pennsylvania, regard the work of the agricultural experiment stations, and that of the Pennsylvania station in particular, as of very great economic and practical value to the farmers of the State and of the United States, and that we hereby request our Representatives in Congress to use their best efforts to secure the continuance of the appropriation for its support in such form and under such supervision by the authorities as may be necessary to ensure that the money shall be faithfully and honestly expended for the purpose designated in the Hatch act.

Resolved, That we would welcome and invite an impartial and thorough investigation, by competent authority, into the management of any and all of said stations, to the end that any abuses, if such there be, may be exposed and corrected.

Resolved, That copies of these resolutions be sent to the two Senators from the State, to the representative in Congross from this district, to the secretary of agriculture, and director of experiment stations.

Stereoptican Lecture, "A Trip Through the Northwest," by Prof. J. H. Montgomery, Vice President, of Allegheny College.

Prof. Montgomery gave a very interesting series of stereoptican views, of a visit to the northwest, made by himself, commencing with St. Paul, Minn., and including views of Minnesota Falls, Anthony's Falls old Fort Snelling, prairie fire, bridge at Bismarck Glacier, Indian Chief Sharpnose and family, horse ranch, above the clouds, and a number of other noted places, all of which afforded great pleasure to all who witnessed them.

The evening session closed with music, "A Little Farm Well Tilled," by the Beethoven Double Quartette, at 10 o'clock.

Adjourned at 9.35.

FRIDAY MORNING.

Opened at 9.50.

Questions answered by Prof. Gurler.

Question. Will sweet cream butter keep as long as acid butter?

Prof. Gurler. As far as my experience goes it will not. There is a difference between butter made right immediately, and from cream that has been held 24 hours at a temperature at which it doesn't develop acid. The most experience that I have had with sweet cream butter was in some work that was done at one of our creameries, separating and cooling at 50, and churning the same day. That butter was sent to New York with the regular week's shipment, and the receiver would not accept the goods. He said it was off in flavor. I do not think there is any question but what we develop flavor by the ripening process.

Question. What is the best method of packing and marketing gilt-edge butter?

Mr. Matteson. In just the style of package that the consumers want the butter. Don't commence at this end of the road to tell a man at that end of the road what he wants.

Mr. Gurler. If a man doesn't know what he wants, put up the goods in a tidy shape and use your own judgment. Don't let the package get mussed up. Have the top of the package looking neat and tidy.

Mr. Matteson. Mrs. Busick recommended that the milk should be at animal heat to get the best test, and others think otherwise, what is your opinion?

Prof. Gurler. There are men that are just as far above me when you discuss these points as you can imagine. It would be better to have the opinion of the chemist such as the chemist of the Illinois station or the chief chemist at the World's Fair. When we first introduced the Babcock test I worked with it for about a year and a half; then I turned it over to a nephew who was working in the creamery. I can tell you how a creamery man ought to go to work with the Babcock test. Don't force the Babcock test on your patrons. Do not force it on them, but get them interested in it. Invite them in to see it work, and manupulate the work in a way to create confidence; and after you have created confidence in the work the battle is won. They have then no ground to stand on to make an argument against it. There is no question as to the reliability of it. In Europe they kicked against it in the first place, but now they are coming into line.

Mr. Hopkins. Are the results reliable in the hands of the ordinary factory man?

Prof. Gurler. Yes, in the hands of the ordinary factory man, or a factory man of ordinary ability and a little experience. There are several practical ways to get the test. There is the most chance for error in getting every other day milk. There is danger of taking thickened cream that will not mix in the weigh can. If there are any lumps of cream they will come to the surface very quickly. Take a dipper and stir up the cream in the weigh can. With care there should be no trouble. It isn't necessary to have a practical test every day. Better not do it. It makes unnecessary work and the results are not so satisfactory. There is a variation between the different days that is surprising. The different weeks will compare very closely because there is an averaging up.

Mr. Matteson. Where they are working the Babcock test a man says, "My milk tested so much this time, and the next time it was so much, and I have the same cows and the same feed." Don't you believe that the handling of the cow by the dairyman himself produces that change in the milk?

Prof. Gurler. To a great extent. Any abuse of the cow will make a change in the milk. If you send the dog after them or leave them out in the storm there will be some surprises.

Mr. Matteson. If they go a longer time without milking than usual it will make a difference.

Prof. Gurler. Why, a few years ago we got suspicious of a certain patron. The first day's milk tested away down. It was the morning's milk. Then we got a team and went and saw them milked; and behold it tested just the same. Then we came to the conclusion that it was a difference of time between milkings. If you milk at five in the morning and five in the evening there will be but very little difference in the percentage of fat, but if you milk at four in the morning and at eight in the evening, so that you make a variation between the times of milking, you change the per cent. of fat. All these things should be taken into consideration before you accuse your patrons of watering their milk.

Question. How often do you salt your cows?

Prof. Gurler, I salt my cows every day.

Question. What do you use to keep the milk sweet?

Prof. Gurler. Bichromate of potash. I cannot say that it keeps it sweet, although it practically does. It keeps it so the cream will mix very rapidly. You may take a jar that is three-fourths full, and with a little circular motion and without any severe agitation you will get all the cream mixed right back into the milk. You cannot see any particles of cream. It will be mixed right back very nicely.

A Member. We have been using pulverized borax.

Prof. Gurler. We have used Preservaline. It will keep the cream sweet, but it will not prevent the cream stiffening. It is better to use the bichromate of potash. Some use the bichloride of mercury. They put in aniline to give it a color. That keeps the milk in nice condition so that you can get a nice sample of it. Hold your milk in such a condition that you can get an accurate sample when you come to work the composite test.

Mr. J. B. Smith. Can there be more butter made from a cow by milking her often?

Prof. Gurler. For a short period there can. I would like to simply say, I don't know. They do practice that. They milked them three times a day at Chicago.

Mr. McClintock. They would certainly get a larger quantity of milk.

Mr. Greenlee. How do you manage to keep the cream in the milk that is set over night and make cheese? Can the cream that rises on the top of the vat be ripened, or must you lose it?

Prof. Gurler. I would like to let the cheese work alone. We have made a great many cheese for a number of years, but we are not now making any.

Mr. Matteson. That question has been under experiment in Geneva, N. Y., for over a year and a half by our cheese instructors in the city; and they very clearly explain it, but I cannot tell you how. Dr. Van Slyke, at our last State convention, said that the cheesemaker that couldn't ripen all of the butter fats, over 4 and one-half per cent, wasn't worth hiring. And they gave an explanation of how it was. He described how it should be heated and mixed. The trouble with the men who hire cheese makers is that the executive committee of the corporation want to reduce expenses and increase profits. A man offers to work for $70 or $60, and the man you have has been getting $100, and you hire the cheaper man and get cheaper work. Expert labor is worth all it is getting.

Mr. Gould. In Canada if a man makes a full cream cheese he will not take his milk to the factory twice a day. One of the essentials demanded from the patrons is that they will thoroughly aerate the milk.

Mr. Porter. Do you prefer the steam or hot water?

Prof. Gurler. Steam is preferable. You are all right if you have the steam, and you may be all right if you have the hot water. We have the first Babcock test that was made outside of the Wisconsin station work. There is no trouble about regulating the steam. Now this question of aroma in the butter—I will say we get a high flavor in the butter from fresh cows. I don't think you can make high flavored butter from cows that are nearly dry. We must have sound food of some kind. If we have food that is decayed or musty or mildewed or out of conditon, it will affect the butter.

Mr. Matteson. Is it not easier to feed the flavor off than on?

Mr. Gurler. Yes, a mighty sight easier. We think in the west that a good ration of grain food improves the flavor of the butter. The milk must be cared for properly. It must be kept where it will have no opportunities to absorb bad odors I have seen milk that was heated up to 110 that you could detect the odor of the hog pen on it. That man set his milk in the vat over night. The people do not realize how rapidly milk does absorb everything of that kind. If you use the deep setting process the quicker it is gotten into the water the better, the more cream you will get. If set in open vessels it must be in a room with a pure atmosphere. After we have secured the cream we want to ripen that cream. Develop the acid. We don't want too much acid. I hardly know how to explain that further only to say—a little acid. Cream should not be ripened to the point that you will find whey in the bottom of your cream vessels. Then it is ripened too far. If you have ripened your cream at a higher temperature than what you are going to churn, cool it down to the churning temperature and hold it there for two or three hours if you can. You may take a churning of cream that you have ripened at 70, cool it down 10 or 12 degrees rapidly, and churn immediately; and then you may take the same cream under the same conditions, cool it down the same way, and let stand for a couple of hours and you will detect a great change in the appearance of that butter right in the churn. On the question of washing there is a great variety of opinions, and always will be.

Mr. Matteson. I do believe that excessive washing does injure the flavor of the butter. It removes the flavor. Doesn't the temperature of the water have something to do with it? Suppose you take the butter in its granular form; take ice water and wash it and you will wash out much of the flavor. Take a chicken or a piece of thin steak and cut in two crosswise; lay one of the pieces on ice and lay the other where it is sufficiently cool, and cook the two in the same spider and put them on the same plate, and the piece that lacks the flavor is the one that has been kept too cold. I found the same thing in handling my butter. I said I would never put any ice in my cream or butter, and I haven't for ten years. I may be a crank on this subject, but that has been my experience.

Prof. Gurler. I would recommend washing; but don't leave the water in contact with the butter longer than is necessary. Then comes the question of salting. That should be done to suit the taste. I think when you have these conditions all right you will have butter with aroma and with that waxey texture, too. There is a difference between waxiness and salviness.

A Member. You gave us to understand that cream would take on the conditions of the calf stable. I have found this to be true. I have found that the air drifting from the pig pen would contaminate the milk. Can you make as good butter from a dairy of cows fed on ensilage as you can fed on good clover hay and good grain well ripened, and with a good fair ration of meal and bran?

Prof. Gurler. To settle that, the first and second year I had ensilage I took my milk to the creamery. We skimmed it and churned it by days, and sent it to New York. We marked those packages to call the attention of the parties to whom we were shipping, and asked to have experts criticise the butter. They knew nothing about the conditions. We didn't get it colored perfectly, and there was one point, too, I think, on the grain; but on the question of flavor there was no objection. I am just as confident that sound ensilage will make a milk that you cannot tell from milk made from dry food. One time several years ago I had several gentlemen come to my farm to see me milk my cows. After they had looked things over they wanted to see a sample of the milk. They tested and smelt and examined it and said they could find nothing wrong with the milk. Ensilage is a moist food, and with exposure decay commences quickly. You cannot leave the silo open ten days without damage coming from it. Ensilage has so much moisture that decay will commence, and decayed food will make off-flavor milk. I have had off-flavor milk from hay from the bottom of the mow.

Mr. Hopkins. Is there not more than one variety of formation in cream? Will there not be a different formation in the cream if set in a damp cellar than if set in a good dry place?

Prof. Gurler. Certainly. We expect to do some work by sterilizing the cream, and planting a formation there that will develop the flavor.

Benjamin Culp. Can you make good flavored butter out of ensilage?

Prof. Gurler. Just as good out of ensilage as you can out of anything. One time I went to my family physician and was talking to him about ensilage. He asked me various questions about the condition of the ensilage and the silo, and when I got through describing it he said it was similar to the first stages of digestion in the animal's stomach. The ensilage must be sound. You cannot make good butter out of rotten ensilage. I have had ten years experience with ensilage, and in that time I have tried all I could to find fault with it, and have found none as yet, but I am frank to say that the ensilage must be sound to make good milk and butter.

Mrs. Busick. I have fed ensilage for years. I was the first person in our section of the State to build a silo. I got my information primarily from John Gould. Put up your ensilage as carefully as the good wife puts away her fruit in the fruit season and you will make just as good butter as any June pasture you ever saw in your life.

The following report of the judges on the butter competition was submitted by Prof. Gurler:

Entries and Scores of the Butter Competition at the Pennsylvania State Dairymen's Meeting of 1894.

Competitor.	Flavor.	Grain.	Color.	Salt.	P'k'g.	Total.
No. 1. John H. Rupert, Woodcock, Pa.. . .	35	22	7	9.5	5	78.5
No. 2. W. A. Porter, Freebold, Pa., ...	40	22	13	9.5	5	89.5
No. 3. W. M. Ross, Centerville, Pa., ...	40	20	7	9	5	81
No. 4. A. D. Root, Bear Lake, Pa., ...	40.5	23	14	10	5	93.5
No. 5. Charles Procter, Ovid, Pa..	42	23	14	10	5	94
No. 6. W. H. Cooley, Meadville Pa., . . .	43.5	22.5	14	10	5	95.5
No. 7. O. E. Burwell, Espyville, Pa..	41	22.5	8	9	5	85.5
No. 8. E. Swaney, Cooperstown, Pa., ...	35	20	10	9	5	79
No. 9. H. C. Crawford, Cooperstown, Pa.. .	40	22	12	9	5	88
No. 10. C. B. McDowell, Dicksonburg, Pa., .	41	23.5	14	10	5	93.5
No. 11. R. S. Hartly, Freehold, Pa., ...	41.5	22.5	14	9.5	5	92.5
No. 12. John Fox, Meadville, Pa., ...	36	23	13.5	9.5	5	87
No. 13. J. B. Phelps, Conneautville, ...	41	22.5	13.5	9.5	5	91.5
No. 14. J. H. Reynolds, Meadville, Pa., . . .	35	22.5	10	9.5	5	82
No. 15. T. T. Root, Cambridgeboro, ...	41	22	12.5	9.5	5	90
No. 16. A. J. Bossard, Meadville, Pa., ...	35	20	13.5	9.5	5	81
No. 17. L. A. Tucker, Cambridgeboro, ...	37	22.5	14	10	5	88.5
No. 18. J. H. Garwood, Dicksonburg, Pa., . .	41	22.5	10	9	5	87.5
No. 19. A. L. Wales, Corry, Pa., ...	42	22	14.5	9.5	5	93

Judged by Prof's. H. P. Gurler and W. H. Caldwell, of the Pennsylvania State College.

Prof. Gurler. Some of this butter we found very fine flavored, and some of it the cream had been damaged by some odors about the house before it was ever churned. There were some very fine butters there. The butters that were scored down for flavor was the fault of the maker. The cream had absorbed something.

Mr. H. E. Wright. It would seem unfair to say much about color; you can put any color you want in.

Mr. Gurler. Yes, but color is a point when you go to market.

Mr. McClintock. At the World's Fair color was one of the essential points of the scoring.

Mr. A. L. Wales. I object to taking a sample and then restricting it to that one article. If you are willing to enter into a discussion in regard to our method of making this butter I shall be glad to do so.

President. We have not time to go into a discussion.

Mr. J. B. Phelps. I wanted some information about color. I wanted to know what the standard color was. I would like to know what is the standard color or what is the best color. Can it be colored too high? What is the par excellence of color?

Prof. Gurler. That is a hard question to answer with the mouth. If I could show you some you could get it very readily. Perhaps a light straw color would come nearest it.

Mr. Phelps. Were there any packages that were too highly colored?

Prof. Gurler. I have scored from the New York standard. Philadelphia would take a higher color; while there is nothing too high for St. Louis.

Butter-Making on the Farm.

ADDRESS BY H. S. MATTESON.

Ladies and Gentlemen: I feel right at home here because they have begun to abuse me just as they do where I was born. One man accused me of trying to steal the whole city—I mean the city library. I don't know what to talk about. Mrs. Busick has taken the dairy on the farm, and Mr. Gurler has taken the same line that I wanted to. The best butter that is made in these United States is made in the private dairy, and sells for the highest prices in the markets of the world; and the poorest butter I ever handled in my life was made in the private dairy, and it hadn't any fixed value to it as butter. It would do for axle grease if you didn't care anything for your wagon. No man except the private dairyman has any right to enjoy dairy work at all. The man that shoves his milk off onto the creamery or milk station is only just half living. He is just about half a dairyman. I am not opposed to creameries and milk stations; they are the salvation of this country. If the poor dairymen that you can't get down to the business of making good butter would keep their milk at home and make up that poor butter we would all die of it after awhile. I have been up and down the earth a little looking after butter. I haven't been as far as I am going yet. The country would lose a good deal if the creameries and the factories and the milk stations were to be dropped out, but the man who is obliged to patronize them is only half a dairyman. Mrs. Busick told you how to make butter better than I can. I will tell you how to spoil the butter down at the barn. I will go down to the barn with a shiftless, lazy, filthy man and I will spoil all your skill and you cannot help yourself. I will take a dairyman like most of you have seen, and he will go down to the barn and load up his old pipe and go to milking, and he will milk and smoke and smoke and milk, and the stables haven't been cleaned out for so long that you can smell them before you get to the barn, and after he gets through milking some neighbor will come along, and they will sit down on a bench and visit until the milk gets cold, and it will absorb the odor of the pipe and the odor of the stable, and after awhile he will take it to the house and the wife will do her best, and her work will avail nothing. The smell of that butter will knock any ordinary man off his feet when it gets a little old. Then take another man who will keep his stables as nice as you please. He is a crank on that subject. He would be ashamed to have his neighbors see his barn not taken care of; and he will allow his cattle to drink where it isn't fit for a hog to wallow in, and he will give you a hitch there that the best dairyman in the world cannot get away with. Or he may have an animal die, or something of that kind, and he thinks, "By and by I will bury it." His cows feed around that day after day, and breathe it into their systems, and you finally have it in your butter. Seven of us went into a creamery once to settle a difficulty about some milk that when left a long time smelt as though a rat had dropped in and died. We found out that an old dead horse had been left lying where thirty head of cows drank and then laid down and chewed their cuds. When that place was cleaned up and a pipe put in, the very same creamery went on and sold their goods on the market in good shape, and they had no more trouble. If a man takes the best care of his cows and keeps his tables clean and then allows all kinds of weeds to grow in his feed, he will ruin the most skillful work of the best butter maker in the world. To be sure that you are going to have the cream that will make gilt-edged butter there are some things that you must have. You must have first of all a cow that is capable of furnishing good milk; then you must have pure water, pure food and pure air. I have seen dairies of from 60 to 120 cows where the barns were not ventilated as they should be, and the owner had been so accustomed to the odor that he did not realize it. There are impurities that are being absorbed in the very pail of milk that is left to set there awhile. When any impurity is taken into the cows' lungs it effects her whole system. Pure food, pure air and pure water. And yet a man may have all of these and not have any system about him—one of these go-as-you-please fellows that his wife finds out that he comes to dinner whenever he happens to think of it, and he goes to work when he feels like it—and he will spoil the best dairy in the world. And yet I have seen men that had established a perfect system and you might go into their barns to-day and you would find the coldest lot of animals you ever saw. I find that somehow, somewhere, in the makeup of the cow is the best chronometer I have found yet. You go into my stables to-day and it is as full of light as this hall is now, and the cows are taking a sunbath, and they won't look at you at all; they are hard at work trying to help us out of our finacial trouble. They know it isn't feeding time or milking time or watering time, and they won't pay any attention to you. Go in this morning about 5 o'clock and it is as quiet as you please, but when you come in every cow will get up and look around and get ready for business. Then go down after breakfast and she knows it is time to be watered. If she is thirsty she is uneasy and asking "What is wrong this morning?" Then we feed the grain after that. If you don't follow a regular system your cows never know what is going to happen. When I was a boy I would eat every time it was set before me. After our cattle have been in the pasture a couple of weeks I can tell you if you tell me what time of day it is where you can find my cows if you want to see them. I can tell you within fifteen minutes when they will come down around the knoll there and come in sight of the house. I mean to feed them so well and treat them so well that they will want to be milked just as much as I want to milk them. As the food makes the milk they feel the necessity of it being drawn, and they begin to work on it. A man that milks this morning at 4 o'clock because he is going to the circus, and then doesn't get home until 8 o'clock at night, will ruin his dairy. The milk he milked in the morning wasn't worth half price. The milk he milked at night is not fit to make into butter or cheese either. There have been instances on record in the medical works of the country where the disease has been traced to the child being brought up on cow's milk and death resulted from that disease from the cow, where the milk had been rendered impure and feverish, and the child died of a nervous disease. Physicians tell us that. These are some of the things that come in to spoil the scoring of the butter test. Have regularity in the handling of your cattle if you want them to do as well as they should. We are told that cleanliness is next to Godliness. The Bible says almost the first thing, that "he that takes therefrom or adds thereto shall suffer," but maybe I am getting a little off. Take your Bibles and read for yourselves. Just put cleanliness in ahead of Godliness or have it right next to it and you will find that it will pay you. That cleanliness should be found in your barns and in every particle of food you feed. It should be found just as much in the mangers of the cows as it should in your pails. I fear that right here is a place that a great many think they are all right in their practices. They allow a little waste to remain in the manger before the cows. They ought to shovel it out and sweep it out once in a while. Some one will say that no one but a crank would sweep out the mangers of his cows. A man that won't do it ought to eat off the same plate three times a day without having it washed. A cow is just as clean about her food as a man is. They have just as fine a sense of what is clean and sweet as we have if we give them a chance. A gentleman said to me, "You have blowed and blowed about pumpkins for butter." I said, "I know it, and I will blow again." He said, "Well, of all the musses I ever got into I am in the worst one now. You are away off with your theory." I said, "I will go over to your house." When a man gets up and tells me that I am away off I feel like going right over there. I went. There the cows stood, and the pumpkin was at least four inches deep in the mangers. Nothing but slush. He gave them too much to start on, and didn't clean up the mangers. He said he hadn't cut any for two days, and they wouldn't eat what he had cut. That man is a good man, and he is a good ways from being a failure. He is a well-posted fellow. He can quote Joshua, and is well-informed on politics, but that stable smelt of those half-ripe pumpkins. If you can get your cows to stand a thing of that kind they are away off in their taste. That man's wife and I sat on the same seat at school. I said, "Jim, take your wife down and let her run the barn awhile, and we will see if you haven't the best man where he ought to be." It is the little things that spoil the good butter. A man should treat his cow as well as he treats his wife. Treat a cow just as you would any other lady. You can't get around it. You go home tonight and go into the barn and take your best cow and yell at her from the time you begin to milk until you get through and if it doesn't make a difference in the milk yield I will foot it home. And be kind to your wife, too, when she is working the butter. I mean to be kind to my wife except when I am trying a new churn. My wife will say, "Are you going to try that? You know just how it will be, you will get mad." I go at it, get a little red around the gills, and look at the watch again, and by that time I say to my wife, "You had better go over to your mother's and stay a few minutes." I am kind to her except at these times. If you will only be kind and careful and follow out the little things, the pure air, pure water and pure food, and regular hours of work, cleanliness in every sense of the word, all through the barn and every place else, you will have a pretty good start. Many a man—lots of them make as fine butter as can be found in the world—just as good as anybody can make, and then he stops right there, and his wife will say to him, "What are you going to do with the butter this fall?" "Why I don't know. We will have to send it to the commission house or wait until the butter buyer comes around." The buyer comes and looks as wise as Gurler did when he sampled the butter. He says it is good, but a little off in color. If the color is all right the salt is a little off, and he will have to reduce the price two cents on the pound, and all the while he is just aching to get that butter. That farmer knows that his wife knows more about that butter than the butter buyer does. He will look as though he thought, "That's so; what will you give for it?" And he sells it. That same man, if he has a fine horse to sell will ask every man that comes along the roads if he wants to buy a horse. Now why not advertise your butter just as you do a horse or cow. There are a thousand people who want a nice package of butter where there is one that wants a horse.

When you get on the cars you must talk to somebody. You must find out who your fellow-passenger is, whether he is married or not, where he came from and where he is going to. By and by he will ask you what your business is. Then tell him. I heard a man at the hotel in Ithaca say he had the worst work to get butter this year. I said, "I am a butter maker—my wife and I." "What do you ask?" "Thirty cents a pound." He said, "I have only been paying 28 cents." "Well," I said, "you have been getting 28 cent butter. I will send you a package of butter and you pay the express on it, subject to your approval. If you don't like the butter you just drop me a line and I will tell you how to get rid of it." Suppose it would have to go into a commission house and sell for five cents less, I will lose five cents; but in two years, if that butter suits him, I will make $50.00 off that man. If you are not cheeky enough to do that, many of you have acquaintances in the city that you have always known. If you don't go to the city yourself, just drop a line to your friends and ask them if they don't want a package of butter shipped on their approval. Just tell them to pay you in proportion to what that butter is worth; and the man will go right over to the grocery store and ask what the best butter is selling for to-day; and it will always be five cents a pound more than you could get at a commission house.

There are at New Lisbon four dairymen living side by side. One of them had a chum down in Brooklyn. I said, "Write to him. He has a grand good business there." He sent a package of butter down to that fellow, and he has been sending it for nine or ten years, and this year shipped 8,000 pounds of butter into Brooklyn.

I am giving you a few points from observation and experience. I think the Good Book says that where a man's heart is his treasure is. And then they tell us that if you want to come at a man's heart you must go through his stomach. That is the way a woman would do. When I come in to dinner and find everything on the table that I like, and my wife passes me everything, and I eat and eat, and after awhile I commence to grow kind of happy and at peace with the whole world, then I know there is something coming. Your wife always knows just when to come at you. She says, "I saw a perfect love of a bonnet down town, and it only costs $7.00 or $8.00." And you kind of keep listening and you think how good those things tasted, and the first thing you know you go right down in your pocket, and hand out your pocketbook and say, "You just take that now and go right and get that bonnet." The same thing works when you greese a man with good butter. That is one inducement to make gilt-edge butter.

THE DAIRY COW.—HER INDIVIDUALITY AND MANAGEMENT.

By Prof. W. H. CALDWELL, *of Pennsylvania State College.*

It is interesting to study the development of agriculture, and notice the different changes that have taken place. As the population increased, and the country was developed, the pursuit seems to have passed through different stages, if such we have a mind to term them, each time adapting itself to the demand.

When the land was first settled, the farm produced all the farmer and his family needed. This was the pioneer stage, and crop husbandry was the controlling element. The raising of animals or the production of dairy products was undertaken only so far as the home demanded. The necessity of maintaining the fertility of the land soon became apparent. More attenton was paid to stock, that the crop grown might be fully utilized and the land receive back the valuable elements it had so freely given to the growing plants. Then comes the period of extension. From the little colony on the picturesque shores of the Atlantic the movement has been westward. You are all aware of this progressive movement, and the changes it has brought about. During all this time the operations on the farms have been mainly of a general nature. Growing grain still remained the prominent feature, and stock husbandry was confined almost wholly to the production of flesh.

The rapid growth of transportation facilities soon had a most important influence. Figuratively speaking, this enables our wheat to come thousands of miles. Our cattle may feed upon the open lands of the West or Southwest, or drink the waters of the Amazon. Our most perishable articles must come from nearby the place where they are consumed. Gradually natural causes have led to the present stage of agricultural progress, in which Eastern farmers find dairy husbandry to be more universally successful. In the East the dairymen are the progressive farmers. Their calling demands skill and close attention to details. During the last few years many inventions have aided the work. Experiment stations are giving a great share of their energy to the study of the principles underlying the art, and in scattering information. They are always ready to aid when called upon.

A very intimate friend wrote me as he was rolling across our prairies to his far away home in Japan, where he had been called to impart the results of the progress made in American agriculture to the conditions existing in that empire, "The coming American farmer must needs be a broad, well educated brainy man." How true this is! How much this necessity is observed, as sharp competition is met with in business, and as pressing public questions demand true citizenship! To this end agricultural colleges are maintained, and endeavors are made to place within reach of the dairymen and creamerymen such information as a well organized dairy school can impart.

Nothing calls for more earnest thought or more careful consideration than the dairy cow. Her individuality is too often forgotten.

At previous meetings of this association you have had presented able and minute descriptions of the animals. These, as well as the recent tests in Chicago, and recent experiment work, forcibly illustrate the important part the individuality of the cow plays in her profitable production of dairy products. All profitable animals do not belong to one breed—and there are many whose only certificate of registration is their actual work at the milk pail or churn. They are individual animals. Seek them among what you have. Breed from them. Like begets like. You will thus secure animals whose temperament and characteristics are for the purpose you desire. It is thus a question of cow, not breed. The breed may be left to the fancy of the owner. Many of you possibly remember the story so forcibly told by ex-Gov. Hoard, on the experiences of a breeder of swine at one of the Southern fairs. This breeder, having had his patience taxed by the people passing his fine pen of Berkshires and giving what seemed to him undue attention to an adjoining pen of "razor backs," finally accosted an observer and wanted to know the reason. The reply came, "You 'uns hain't got the kind o' hogs we'uns wants; we'uns want a hog that'll outrun a nigger."

This law of natural selection applies with equal force to the dairy cow. The progressive dairyman wants a dairy cow whose lines of temperament and functions are for milk or butter, as may be desired. It does not necessitate fancy bred stock. Don't, however, believe I wish to raise one word against pedigreed stock. There is a place for it, and it should be more generally distributed than it now is, and farmers should be more eager for its influence. My object now is to take the problem confronting the hundreds of dairymen whose conditions have not led to the same. Competition and economy are forcing them to

Improve Their Stock.

This lesson of individuality should be a most encouraging one to them. They undoubtedly have many a fine profitable dairy cow in their own herds. What is needed is to have some plan of improvement. This is the problem I now present. For its solution, you will readily observe that,

First, must come a foundation upon which to build.

Second, a means of improvement.

Circumstances often make it not practicable for a dairy farmer to secure all his foundation from registered stock of high character. This should not discourage him. With a careful understanding of the general character of a dairy cow, one may select from his own section profitable individuals.

Three years ago I had the pleasure of laying the foundation for a herd of my own; finances had a controlling feature; my aim was to have a butter breed herd of cows. I selected from my own locality some young animals showing unmistakable traces of Guernsey and Jersey blood. I chose as a means of improvement a good Guernsey bull, purchasing at same time a young heifer. Having managed the herd through proxy, I am not able to give as definite figures as I would like to. All that I can say of the result is that I now have a good, profitable herd of young cows, and when it was my last privilege to spend a few weeks with them, I was particularly pleased with improvements which had come through this grading up. I can now see a lot of young heifers all taking after the Guernsey.

The Massachusetts Agricultural Farm has kept a very interesting account with a herd of twenty grade cows for one year, November, 1890, to November, 1891:

Dr.	
Cost of cows,	$1,000 00
Net cost of feed, November to May,	396 23
Net cost of feed, May to November,	355 25
	$1,751 48
	$2,451 55
Cr.	
37,628 spaces of cream at 3¾ cts.,	$1,411 05
12,480 gallons skim milk at 2 cts.,	249 60
Calves sold from herd,	40 90
Value of cows at end of year,	750 00
	$2,451 55
Profit,	700 07

The average weight of these cows was 990 pounds; age, eight years. They averaged 7,019 lbs. 2 oz. of milk, and 308½ lbs. of butter during the year, making the value of the product, $83.03.

The net cost of feed, which is obtained by deducting 4-5 of the fertilizing value from the gross cost, is $37.57 per head. The result is that the College was able to pick up 20 grade cows, feed them well for one year, at an average net profit of $45.46. Can not others do the same, and is not this a desirable foundation for anyone to build on?

Two years ago, our Experiment Station wished to start a dairy herd. They chose to start with a carefully selected herd of grades, in hopes that in a few years there might be a herd on the farm, the result of selection and improvement at the hands of those in charge, and an example of the easiest and most economical manner in which a good dairy herd can be built up. Three car-loads were purchased. One came from Indiana county, this State, and contained good milking cows, showing mainly signs of Short-horn blood.

This was an illustration of our common stock. They generally show signs of this breed. We found in this lot a few of our best cows. Not only are they most commonly met with, but such an animal is valuable, wherever it may be placed. Their most important characteristic and that which makes them of special interest to us now, is their special adaption for the improvement by crossing with other breeds.

It is easier to make an impression upon such animals than upon the breeds which seem more tenacious of their characteristics. They will give to their offspring size and good milking habits.

Another car-load was of grade Guernseys, and a few full bloods. For the third lot came a car-load of grade Jerseys. In this instance a Guernsey bull was taken as the means of improvement, and a herd of 60 head now stand in our stable, which prove to be an interesting family. Not a cow was kept after last January that gave less than 200 lbs. of buter fat, which would be equivalent to 250 lbs of butter. Four of them, one a grade Short-horn, two grade Guernseys, and one full blood Guernsey, produced from 350 to 375 lbs. of butter in the year.

These are but instances which many a progressive dairyman can duplicate. This selection of such a foundation and means of improvement must be supported by intelligent

Management.

This I would divide into two parts for your consideration: (1) The stable life of a dairy cow; (2) The finding out and keeping track of the results of each animal.

The first essential is to provide a good house for the animals; I would include in that all that was for the health and comfort of the animals; it need not be expensive, but warm, well lighted and ventilated, and with good sanitary surroundings. A much respected instructor of mine once gave us advice regarding the condition of our barns. "Go into it yourself, and if you would be willing to live in it, it is ready for your stock." A plan cannot be given that would be adapted to all surroundings. The ideal arrangement is to have the animals in a stable that is out from under the fodder, and not over the manure. How near this can be accomplished, each one must determine for himself. I have seen it accomplished in two ways; one by building the stable as an L, and the other as a lean-to in connection with the storage barn. With proper planning and the use of trucks, the labor of feeding and caring for the animals is reduced to a minimum.

Especially should the construction, ventilation, and sanitary surroundings receive urgent consideration, when so much attention is directed to our dairy herds as at the present time, with the prevalence of such diseases as tuberculosis and abortion.

The animals should be tied so as to give as much freedom as possible; a simple manger answers all purposes, and is easily kept clean and sweet.

The feeding of dairy cows should be planned under two systems, one for the winter and the other for the summer. The first thing to take account of is the products of the farm; the nearness to railroad, whether heavily stocked or not, and the size of one's pocket-book, will all call for consideration when one plans for supplementing home supply. A well filled silo, a good lot of clover hay, some roots, with possibly a little corn stover or corn fodder, is a good winter supply of coarse fodder. For grain, bran and gluten will furnish bulk, to be properly balanced by cotton seed, with possibly some corn meal, as circumstances warrant, and linseed meal as a corrective.

The Cornell Experiment Station experiments show that pasture is the cheapest food during the summer. On the other hand, at the

Massachusetts Agricultural College, as well as at our own Station, a comparison of the soiling system and pasturing, showed soiling to give greater returns in general herd management. Our experiments compared the two systems on the basis of their food content and its digestibility. The result was that pound for pound of green weight, pasture grass is the most valuable of the crops compared, clover next, and rye third. Corn varies greatly in value according to the time of harvesting. Considering the work from a financial standpoint, we received greater returns from our soiling system, being about $7 in case the grain is raised at home, and over $15 if the proper and rich grains are brought to supplement. At the same time, when there was plenty of good pasture, and the farm was not heavily stocked, and little grain bought, it seemed an open question whether the soiling system would show as much advantage.

The Massachusetts comparison is particularly interesting. Thirty acres of land, about 4-5 of it good grass, the balance somewhat covered with stumps, but with much sweet feed between, was used as a pasture for about thirty cows and heifers. The returns in cream sent to creamery amounted to $454.96. The improvement to the young stock was reckoned at $100, making a total return of $554.96. The land was cleared of stumps, drained and then furnished green fodder for practically 32 cows. The gross receipts of the land then were:

Cream,	$683 52
Squashes, 25 tons,	250 00
Potatoes, 1,522 bushels,	570 78
Rye and straw,	128 00
Turnips, 200 bushels,	20 00
Total gross receipts,	$1,652 30
Total previous season,	554 96

This leaves a balance in favor of the crops of $1,097.34. Deducting from this the labor of raising them, and cost of fertilizers and manures, the net proceeds in favor of crops was $914.47, against $554.96 for pasture. The labor of improvement in draining, etc., was not taken account of, as it was permanent, and the benefits derived from it would extend over several years.

Undoubtedly, with intensive farming, the soiling system will give greater returns, and save taxes on land, a serious question with Eastern farmers. In case of soiling, grain will be fed, and the general condition of pastures requires same, or the feeding of soiling crops some portion of the time. The waste by the tramping of the animals is also large. Gluten, bran, and linseed meal are the grains most desirable for summer feeding.

After all the careful thought and planning this work requires, there is yet a most important point to be considered; the dairyman must know his cows as individuals. Mr. Haris Lewis, a successful dairyman, in New York, once questioned the practicability of the dairyman, under average conditions, keeping track of the details of his herd. His own herd made a profit, and that was all that was needed. A friend finally pursuaded him to keep a record in detail of his work. He was surprised to find that one-third of his cows were being kept at a loss, another third were barely paying their way, while the remaining third were not only giving him the profit but also making up the loss on the others. He quickly got rid of the unprofitable ones. It is the only way in which we can keep up onr line of improvement.

To a dairyman, the estimation of the value of a cow by her yearly production of butter, has become of utmost importance. Especially is this true since the introduction of the Babcock test. This test and a milk scale furnish a ready and inexpensive means within reach of every farmer. He should set his standard, and all animals falling below it should be disposed of.

Two years ago, the dairy herd at our Experiment Station was started on this plan. At the end of the first season, we found animals ranging from 375 lbs. to 103 lbs. of butter. The few falling below 200 lbs. were disposed of. The second season is now ended, and we find but two or three below 250 lbs., and as others have come into profit, these will be sacrificed.

Duringthis time some experiment wark has been conducted, which may be of interest in this connection. It bears especially upon this question of the individuality of the dairy cow. The object of the work was primarily to study the influence of varying quantities of feed upon the economy of butter production. Ten animals, representing the poorest as well as better cows of the herd, were fed for 101 days on the following ration:

Period	1.	24 days,—10.7 lbs.	grain,	14.5 lbs.	hay.
"	II.	21 " —13.0 "	"	15.9 "	"
"	III.	32 " —15.1 "	"	15.1 "	"
"	IV.	14 " —12.2 "	"	14.9 "	"
"	V.	10 " — 8.5 "	"	12.8 "	"

The grain consisted of a mixture per hundred pounds, of 54½ lbs. corn meal, 27⅓ lbs. wheat bran, and 18⅔ lbs. linseed meal. Timothy hay was used.

The cost of the food in the different periods, the value of the butter and the net profit produced, was:

	Daily cost of food.	*Value of butter.*	*Net profit.*
Period I, ...	19.9	29.6	9.7
" II, ...	22.4	33.2	10.7
" III, ...	25.1	31.0	6.0
" IV, ...	20.1	29.6	9.5
" V, ...	17.1	20.4	3.2

Comparing the periods, the following results are shown:

Starting with period one, when the average cost of food was 19.9 cents, an increase of 2.5 cents in cost of food produced an increase in the value of the butter produced of 3.6 cents, or a net gain of 1.1 cents per cow, amounting to 27.2 cents per day for a herd of twenty-five cows, or $72.50 per year.

A further increase of 2.7 cents per day, making the ration cost 25.1 cents, showed no increase in the butter product, and was therefore fed at a loss.

At this point a reduction in the daily cost of the food consumed to 20.1 cents per cow, showed a net gain in the daily profit returned, of 3.5 cents over the period when the ration cost 25.1 cents; amounting to $262.50 per year for a herd of twenty-five cows.

A further reduction of 3 cents per day in the cost of the ration, making the average cost 17.1 cents, gave the smallest net profit of any period in the experiment, amounting to a loss of 6.3 cents per cow per day when compared with the ration costing 20 cents and 7.4 cents per day per cow in comparison with a ration costing 22.4 cents.

This means a yearly loss on twenty-five cows when compared with the ration costing 20.1 cents of $472.50, and $555.00 when compared with the ration costing 22.4 cents per day.

This shows that judicious, liberal feeding plays an important part in the profitable production of butter. From these experiments it does not appear to be profitable, in the average case, to increase the food as long as there is an increase in butter produced. Beyond a certain limit, as at the end of the second period in this experiment, the increased product was made at a greatly increased cost of food. In other words, the limit of the appetites of some cows is beyond what their owner is warranted in giving for profit.

It would seem that while there is this loss from over feeding, there is a greater probability of loss occurring from under feeding, in ordinary practice. This point of profitable production varies with different animals.

This was very marked in my experience last summer with one of the herds in the Columbian Dairy Test. One animal I remember, a grand cow, of great capacity, who ranked first in the Guernsey herd, during the long 90-day test. She was then fed all my judgment said she would profitably consume. In the following 30-day test I was urged to crowd her more, as [illegible] had such great capacity, size and vigor. I did, and she fell from her foremost place to fifth in the herd. I might enumerate many instances from that interesting family of twenty-five. One other, a daughter of a cow who has taken first premium at our State fair three years in succession; hardy, vigorous, never having been dry in her life, and who never refused her feed during that hard, long summer's stabling. At one time I tried to crowd her; she ate the food, but there was no increase in product.

I would mention the third animal, one of the smallest in the herd; she ate fully as concentrated food as any, and far more in proportion to her weight than some more than one hundred pounds heavier than she, or the ranking ones. Her production was above the average of the herd, yet the limit of her appetite was far beyond the period of economy.

The fourth animal, the last I shall mention, was one weighing over 1,000 pounds, and apparently able to equal any of the herd. She could not be fed up to her most profitable limit of production under the conditions. I was asked several times, and since the test closed one person, who has been discussing the results of the work at public gatherings, wrote me, wanting to know "why I did not feed this cow more; her weight would not allow her to have been much higher fed." This was not the case. I tried to feed her, and her strength was not equal to the task. Several times was a cold sponge put on her head to keep away the rush of blood. Good cow that she was, yet her individuality did not allow her being fed like the others of her size.

Coming back to our experiment work referred to: Not only was there a wide difference between the ten cows used, but the same is true in the net profit returned by two animals, producing practically the same quantity of butter. For example:

Marguerite gave 6,512 lbs. of milk or 296 lbs. of butter; Ramona gave 5,459 lbs. of milk or 279 lbs. of butter.

Baring differences in breeding, Marguerite would have been regarded the superior cow, and commanded the highest price. Referring to the daily net profit returned by the animals, a remarkable difference is found that is not indicated or suggested by the butter or milk records.

Assuming that they remain fresh for 300 days and taking the average net profit per day of all periods, we have a yearly profit for

Marguerite of,	$31 50
Ramona of,	61 50

On this basis, at the end of six years, which for this case, we assume to be the productive life of a cow, and disregarding the offspring, they would have made a total net return for

Marguerite of,	$189 00
Ramona of,	369 00

This means that Marguerite would have yielded ten per cent. compound interest on a purchase price of $106.00 while Ramona would have paid the same dividend on a purchase price of $208.00.

Unquestionably the presumption is in favor of the animal producing the largest quantity of butter per year. On the average, this is true, but the most successful dairyman has to deal with individuals rather than averages, otherwise it will be impossible for him to derive the greatest possible profit from his business.

These facts are in no way applicable to the farmer who has yet to learn what each animal in his herd is producing; to him the use of the Babcock test and milk scales is of paramount importance. But to the careful, thoughtful dairyman, there is undoubtedly an opportunity for a great saving, by applying the feed test to each animal, as well as the butter test, and weeding out those animals that do not make satisfactory return for the food consumed. It is true that this involves some labor and pains, but requires a small outlay of money. While making such a test he will also be able to determine the quantity of food that each animal requires for the greatest profit, and be, thereby, doubly repaid for his labor.

This is a large, open field to travel in; a thorough, intelligent study of it will bring profitable returns. Education is the salvation of dairying. The calling demands skill and close atention to details. Push on with your best and brightest hopes. Success comes to the deserving.

THIS AND THAT ABOUT DAIRYING.

Watering Cows and Exercise.

By Geo. M. Orris.

From a financial standpoint, it pays to provide water for the cows in the barn, and give no exercise. They will give more milk for a time and make more butter, but for the general health, and the good of her future progeny, we think it is best that the cow be turned out to get water, and at the same time get some exercise going to and from water. Now, we know that the cow is not a creature given to much exercise, but we have observed that there are times that the cows prefer to stand or move about in the sun for a while, not caring to enter the stable though the door be left open. They will not stay out in a storm of their own accord. In ordinary winter weather it is better to stay out a short time, but not long enough to chill. Cows fed on silage require less water than cows fed wholly on dry feed, and it is very seldom we can get our cows to go to water more than once a day, while we are feeding it; but on dry feed, we can get them to go and get water twice a day. A cow in full flow of milk will use more water than cows that are not. Now, cows are built so by nature that they will gorge themselves full, if left to have their own way, whether it be on feed or water, then lie or stand and ruminate. We have offered water to cows at different times in the day, but as a rule, they will fill themselves but once. If they take any after that, it will be only about one half of what they drank in the morning.

On very stormy days, it is better to water in the stable, if possible. Now, cows that are grained heavily and watered in the stable, with no exercise, have a higher temperature than cows that have been turned out and watered with ordinary spring water. This is no guess work, but actual observation of cows treated in the different ways, by taking their temperature. Water and exercise should go together. We have had more trouble to get cows with calf when not exercised, and it has caused no little amount of trouble and annoyance in not having the cows fresh when we wanted them; and we have seen more trouble with cows that are tied up all the time; and more non-breeders develop than when they are exercised. To be sure, there are other causes for cows failing to breed, but we think this is one of them; taken as a whole it will give better results to combine water and exercise.

Shall we Raise our Cows or Buy?

It seems to be getting to be an impossibility to buy a good cow, You can buy what is said to be a good cow, from the standpoint of the seller, but there is sometimes a wide difference between the opinions of the parties buying and selling. They will tell you that the cow gives so many quarts a day. They count in the froth, of course, as milk. I have never yet been able to get as much milk out of any cow I ever bought as the owner said she would give. The best cows I ever bought, the cows giving the most milk, and the richest milk were hard milkers, their owners getting rid of them on that account. As a rule, a cow will not do as well after she is changed from one place to another. It requires some time for them to get accustomed to the different methods of care and feed. We invariably over feed a cow brought into the stable, feed her as carefully as we can. It seems to require time to get cows on full feed, as well as a good deal of patience.

It requires a great deal of expense and patience to raise one's cows; a careful selection of the heifers of the best cows often disappoint one so that a person is apt to get discouraged, this way.

A careful selection of heifer calves from the best young cows, cows not to exceed seven or eight years, are sure not to disappoint, for a cow increases in value up to almost this age, and invariably begins to go down the way they came up. The better a cow is fed, the sooner she will reach her zenith, and the sooner be worn out. I have often raised heifers from splendid butter cows, and their first calves were better than their last. We do not approve of raising calves from too immature cows. I do not think the cost of raising ones calves will exceed the cost of buying them, for by the time they are thirty months old, they will help pay their way. Then, a heifer can be moulded into a good butter cow by judicious feeding; for a long continued feeding of rich feed will invariably tell in the fat in the milk. We have observed that heifers out of young cows were better feeders than heifers out of aged cows. Why should not cows be bought and sold by the scales and Babcock test, a value being put on them for what they really are?

Jersey cows are sold on their butter records.

Filling the Silo.

Another season of wilting corn before putting into the silo, makes us more in favor of the practice, so much less acidity is developed in the silage, cows eating it with a relish. Now, by raising the big Southern corn, and cutting and putting in to shocks of ten rows wide by ten to fifteen deep, we have a very large shock in which the corn can mature, or rather come to a state of ripeness, that will take longer to attain on the stalk, and then it is out of danger of frost; and by raising the large corn you can get so much more to the acre.

We raised a field of corn that was put in late on account of the freshet we had last spring, and it being a little thick, did not ear any too well; so we put the binder in when it was coming in to roasting ears, cut and shocked it in 5 or 6 bundles in a place, waited a few days, then doubled up the shocks, tied the tops together, then let it stand in the field until thoroughly cured; and the result is we have one of the finest feeds we ever fed. We only feed one bundle per day, with silage and clover hay, and the cows are doing well.

Summer feed.

There is no doubt that we have got to put in more feed for the cows in summer and fall, and the first corn put in is corn for the cows;

for it should be at a good state of maturity before being fed. A few days or weeks delay causes trouble when the pasture begins to get short. It seems that we have to feed cows more or less for ten months in the year, they finding their own feed in the pasture from last of May until last of July, when lack of rain, and the hot sun dries up the grass. It looks now as if we should have to put in an extra silo and fill it for the next years' drought period. Last season an extra grain ration of gluten meal and what grass there was gave us a full flow of milk, while there was a decrease of 30 per cent. per day in the flow when wheat bran was substituted for the gluten meal. Gluten meal fed with low grade flour made from spring wheat, makes the best milk producer we ever fed.

Ventilation.

Ventilation is one of the things that is neglected in many stables. We have visited a number of stables where there was no possible chance for the foul air to get out, or fresh air to come in. The sides of the stable were damp from moisture from the cows' breath. A cow uses a great amount of air per day, and should have a good, fresh supply all the time. Good ventilator shafts are a necessity, as they draw the foul air out. Where the ventilation is not perfect, there is more danger of contagious diseases, especially lung trouble; and as good an article of milk or butter cannot be produced if the air is not good.

Carding Cows.

If there is one thing that is done in the cow farm that pays so much for the little labor expended, it is carding cows. A good carding every morning is a necessary chore with us, and we firmly believe that we get more milk for doing it. It keeps them clean, and makes them feel good. Cows left to themselves out of doors will do more or less rubbing against trees, fences, posts, or corner of a building; and the rougher it is the better they like it. Cows kept in the stable most of the time are deprived of this privilege, and carding comes nearest filling the bill. Cards are cheap, and with one in each hand, a man can go over a herd of cows in a very short time. Then, from a cleanly standpoint, if for nothing more, cows should be carded; for who is it that likes to milk a dirty cow, and we think that a good deal of stable odor to some milk comes from the taint being absorbed through the pores of the skin into the blood, and from blood to the milk.

Absorbents.

One of the essential articles in the dairy barn is absorbents to take up the liquid manure of the cows, which contains nearly all the nitrogen. According to some writers the liquid manure from a cow is worth more than the solid. The first thing, however, is a tight floor, so that it cannot escape. Cut straw, saw dust, or horse manure, together with land plaster to hold the ammonia, form the cheapest absorbents we can get, and pay many times over their cost. Cut straw will take up three times the amount of liquid that uncut will. The German potash salts are now recommended in place of plaster, as they cost not so very much more, and are just as good or better for holding the ammonia, and then the potash they contain are very needful to most of our land.

AFTERNOON SESSION.

Opened at 2 P. M.

Economy of Cattle Foods.

Demonstrated by use of chart.

J. B. PHELPS.

Fertilizers in One Ton.

Cotton seed meal,	$28.68	Pounds	226.8
Linseed meal,	21.42	"	160.8
Wheat bran,	11.65	"	116.5
Clover hay,	8.20	"	66.2
Crushed oats,	8.17	"	61.0
Mixed hay,	6.99	"	70.7
Corn meal,	6.31	"	50.5
Timothy hay,	5.48	"	53.5
Oat straw,	2.58	"	11.5
Wheat straw,	2.21	"	22.0
Corn silage,	1.28	"	11.8
Mangolds,	1.00	"	10.3
Butter,	.48	"	2.8
Potatoes,	2.02	"	22.5
Milk,	2.80	"	21.4
Wheat,	7.09	"	58.1
Fat pigs,	6.92	"	51.9
Fat sheep,	8.14	"	64.9
Fat calves,	10.55	"	87.6
Fat oxen,	11.80	"	83.1
Cheese,	20.83	"	146.8

The left hand column represents the fertilizing value per ton. The right hand column represents the pounds of fertilizers in a ton.

Mr. Phelps. You have listened to a good deal of talk, much of which has been instructive, and I suppose you are all tired. It is embarrassing for me to talk on a subject that I suppose many of the audience know more about than I do. I will try and bring out some points that every farmer in this audience can understand.

The first thing that occurs to me in the economy of cattle foods is this: It is very poor economy for you to undertake to regulate your cattle foods in a cold barn. I want to try and explain that to you so you will understand it fully. We are today in Crawford county laboring under a disadvantage by having cold barns. Now, as the food that goes to the cattle is to support the animals, and the butter fat is all carbon or heat-producing, you see at a glance that when you are making butter or milk it is economy to keep them from expending too much of that material in keeping themselves warm; and you have to keep your cattle warm so that they won't use it in keeping up animal heat. Farmers througrout the country are keeping cattle warm at the expense of food. We feed cows for a purpose; and that purpose is for us in the dairy to get more milk and butter and make more cheese. That is our object. These foods are all based on certain materials that go to make up the products of butter and milk. these foods are based on two great materials. In regard to scientific papers—we have an idea that it means some great thing that we cannot understand. It means a knowledge of truth. Finding out the truth for truth's sake. We want to know solid facts. These two things that go to make up cattle foods are albuminoids and carbohydrates. Albuminoids make the flesh and strength; carbohydrates make the heat. In feeding it has been demonstrated that the relation existing between the two is a certain per cent. of the one and a certain per cent. of the other that goes to make a balanced ration. You must learn a cow's individuality before you can feed intelligently.

A general ration for a general purpose of all 'round feeding is an average of about 1 to 5 or 6. One part albuminoid and five or six parts carbohydrates. In some animals that are inclined to lay on fat you want to change that ration. Make it 1 to 5. Those that are inclined to give milk and are inclined to grow poor all the while, give more carbonaceous food. Give them more of the fattening properties and they will do better. The great object in feeding is to get these ingredients right. All foods have these ingredients. Suppose oats are a short crop, and worth 40 or 50 cents a bushel, and other foods having a great deal of albuminoids are cheaper. Better sell the oats and buy the other product to balance it with. If you have an article that is worth more to sell than to feed, sell it and get an article that you want at a cheaper price. It is expensive to feed the dear foods unless you can balance them up with cheap foods. The cheapest food that I can feed is ensilage. Balance it up with other foods that you can find. It is the cheapest food and the most suitable food that you can find for the animal; especially in the winter time. We find out that when the cold days of winter came that we want something that will remind us of summer. In the summer when we have lots of fruit and garden stuff we can store them and eat them in the winter time. And it is not a bad thing to do, either. But we go on feeding that same old ration of timothy hay to our cattle from fall to spring. When you sit down to eat you balance your own ration. You don't eat all bread or all potato. You don't eat one kind of food until you satisfy yourself. Now, the cow in your stable has to depend on your intelligence for her support. You must balance her ration for her and then she will give satisfactory returns. Last fall I had ensilage, and it was a very poor year for oats, and I cut my oats green. I fed those oats in the bundle to my cows. I got corn meal and bran. It was the best I could do. My cows were not doing as well as I thought they ought to do in the amount of butter they turned out, and I knew I wasn't feeding a balanced ration. I knew I wasn't feeding right, and I thought I would get some linseed meal, but the demand for it was so great that the price went up and it was too high for me. The next best thing was cotton seed. I knew it was very strong. I got cotton seed meal at last. I was feeding fourteen cows and getting fourteen pounds of butter, on ensilage and a sheaf of oats at noon, 40 pounds of ensilage a day, and corn meal and bran, at a cost of 16 cents a day to each cow. That is what it cost me, reckoning two and one-half tons of ensilage equal to a ton of good hay. I was getting fourteen pounds of butter at a cost of 16 cents a cow from fourteen cows. That is a pound a head from each cow. I got a carload of cotton seed meal and commenced feeding, and in a week's time, to my surprise, I got 18 pounds of butter at a cost of 14 cents per day per cow. I told my son that that knocked the theory right out, of not feeding butter fats into a cow. Here were the facts, and they are stubborn things. This is what I got with about the same amount of milk. It is generally considered by the experiment stations that the casein and solids run parallel with the butter fats. If you want more butter out of a cow you must increase her quantity. Here I got four pounds more of butter from the same quantity at a less cost than I had before. I got thirty cents a pound for my butter. That is my experience in regard to this balanced ration. I began to think about these things, and about what others were doing.

There is one other thing I want to speak of in regard to concentrated foods. Most men think they must feed what they have on the farm and must raise all their foods on the farm. I don't altogether agree with them. I will raise my carbohydrates, my cheap foods, on the farm, and I will buy my albuminoids to balance it with, and then I have it back on the farm as a fertilizer. Hosts of men today are feeding timothy hay and carbonaceous foods and buying feed in the spring at $28 to $30 a ton. It is a question whether the farmers will stand it in a few years if they keep on with that kind of business. The best fertilizer I can find is the whole fertilizer from the cow stable, and applied directly to the surface of the soil as fast as made. The fertilizing business comes in here. Keep up the fertility of the farm.

You can take a farm at four or five thousand dollars today and farm it four or five years and then have a bank account, but your farm is no better. I would rather have it there where I know no man can get it. It is solid. I have a chart here that was taken from the chart of cattle foods at Cornell University, and I got it copied to use on this occasion. It will show us what fertilizers are worth. The question is often raised, "What part of foods do the cattle retain?" I don't know. I have seen it in print, and I wrote to Dr. Armsby about it. He wrote me, "On an average of 70 to 80 per cent. of all foods go to excretion." So you see the necessity of feeding something strong in fertilizing qualities. These are based upon the commercial value of fertilizers. We have nitrogen, phosphoric acid and potash in all fertilizers. These sell in the market at so much per ton. Ammonia is worth seventeen cents per pound; phosphoric acid and potash from six to seven cents. The best phosphates we have are strongest in ammonia and nitrogen. We have cotton seed meal worth $28.68 per ton, and 70 per cent. of that goes back as fertilizer on the farms. We pay $28 to $30 for phosphates, and 70 per cent. of them will go back on the farm as a fertilizer. Linseed meal $21.42; clover hay $8.20; timothy, $5.48 a ton. Clover hay is worth today about $2 more a ton as a fertilizer, than timothy hay. Corn silage is $1.28; mangolds about the same. Butter 48 cents. That is all the fertility in a ton of butter. Potatoes $2.02, and milk $2.08. Not as good as clover hay. Cheese is worth $20.83 as a fertilizer, because the albuminoids are concentrated in the cheese out of the milk. I presume that is right. I have no reason to question it. The question arises now, "Which is the most economical in feeding, taking all things into consideration?" Are we feeding right? We are feeding timothy hay today and buying phosphate in the spring. Cattle don't care anything about it in particular. They will live on timothy hay, and so would we live if we hadn't anything but corn bread to eat between this and next spring. Isn't it economy to feed some of these concentrated foods instead of buying fertilizers in the spring? Isn't it economy to take linseed meal and spread it on our farms? The increased fertility of our farms increases our bank accounts, makes more milk and butter and makes us happier.

Discussion.

Mr. Denny. Would linseed meal have given you better results than cotton seed?

Mr. Phelps. No, it won't do. The ensilage business comes in here, too. We want the ensilage in the winter for the cattle just as we want the cherries and the berries that the good wife has canned. Make summer for the cow by keeping her warm and feeding her summer food.

Question. Is that feeding the old process or new process meal?

Mr. Phelps. It is the new process meal. It is quite an oily meal. There is a little more oil in the old process than in the new.

Gathering Up the Crumbs.

Mr. Matteson.—It would do every farmer in the State of Pennsylvania good to have these tables showing the fertilizing value of the makeup of the composite parts of all these foods. Your experiment station sends out these things. If you haven't your name on the list at the experiment station, send him your name and you will get all these things. I want to speak of the positive proof, that the gentleman said he had, that he had increased the butter fats. As I understand, just previous to that time he had been feeding an unbalanced ration. There is the point exactly. I claim, and my experience of 25 years backs up that claim, that a cow cannot be fed above or beyond her normal limit; that is, what she is brought up to, but a man may be handling that cow, and he doesn't feed her a balanced food, nor sufficient food, and another man who has the skill takes that cow, and to and behold! pretty quick she not only increases the amount of milk but the butter fats will be increased. You are simply getting the cow up to where she belongs. Suppose you board an engine that was built having certain possibilities. There are two men running that engine that are not feeding her fuel enough to make the steam she needs. She needs steam enough to do what she was built for, but you test her and you cannot, to save you, get more than 30 miles an hour out of her. You go back to the man and tell him that engine is a failure. He gets on there and takes a man with him to handle the throttle and somebody to feed, and she runs right up to where she belongs, and does it handsomely, just as he said she would. A cow is built on the same principle. There is a piece of machinery that is born and bred for a particular purpose, and when a good, skilled man gets hold of her, she goes right up to where she belongs. Why not shove her up to any amount of butter fat that you have a mind to. I want every man in the audience that has tested his cows individually with the Babcock test to see what they were doing, to raise his hand. (Eight hands raised.) That is a better percentage than we found in my state last week. In one of the largest butter counties in the State, where the court house was filled, I asked the janitor what the estimate of the crowd would be, and he said about 250, and only four men had tested their cows individually. How do you know whether you are feeding butter fats in, or whether you are getting all you can or not? You will be awfully surprised when you test your cows to see what a load you have been carrying. You have heard it said that one-third of the people are running in debt every year; one-third just paying expenses, and the other third have to get down to business to support the whole family. When you come to test your cows you will find that from some you get about 2 per cent. of butter fat, and you will go to work and do your level best and she will soon increase the amount of milk, but the amount of butter fat will remain the same. J. S. Woodard, one of the best dairymen I know, sells off everything he has for beef. He went right around among the farmers last fall and bought up all the farrow cows he could. He takes them home and feeds them scientifically, for he is a scientific feeder. He understands it. He doesn't ask any man to balance up the ration for him. He builds up the frame, and does as any man ought to do, and makes a good profit out of it. You test your cows. I wish every man here could feed butter fats into the milk.

Mr. Phelps. I believe today that there are a great many cows in the country that are good cows if you will only develop them. Lots of the cows you are keeping today are running you into debt. We must study the individuality of our cows and know what they are doing. In regard to this butter test, I will give a litle experience. Last year I was convinced that I must have a Babcock tester. I had it fixed in my own mind that certain cows, were just the cows. The first four I tested I thought the result was wrong. Then I tried it again with the same result. I said, "I will try once more," and I tried it again with the same result. I said, "There is no use in trying any further with this thing." Last year I was making butter, as I am this year, and it was tight nipping to make a pound of butter from a cow. Last spring I fed well and had my cows in good condition, and eight of them went to the shambles. This year I am keeping 24 cows and am making from 24 to 28 pounds of butter a day. I have increased four pounds a day.

Mr. Matteson. A Babcock milk tester costs $8.00. These young farmers think that that is too large an amount to spend these times, but I will tell you how to do it. Get the machine, and instead of lending it, if your neighbors want to test their milk have them bring it over to your house and test it for them, and they won't hurt the machine. If you cannot do that, take a test by weighing the milk; cream it and churn it and weigh the butter and test it and eat it. But get a tester if you can. Put down the name of every cow and the day of the month you tested her, and everything about it. Then go right along down through. If you have twenty it will take you almost seven days, testing three a day, but you have no idea how interested you will become before you get through. You will find a cow that is not worth anything. You will probably find a big cow there that gave lots of milk, and you get about 12 ounces of butter from her in a day; and right beside her is a little scrubby thing that gives about two-thirds as much milk and you get 24 or 26 ounces of butter. Somehow or other that other cow makes you awful sick at your stomach.

Mr. Heydrick. The time is slipping away, and we must elect officers or we will have an empty house to do business in pretty soon.

Report of Committees.

Discussion about running factories on Sunday.

Report of the Committee on Resolutions.

Whereas, We, the members of the P. S. D. A., do believe that much good would result to the dairy interest of Pennsylvania by the publication of the proceedings at an earlier date than has been customary. And we further believe that the report could be published at a date soon after our annual session without much additional cost. Therefore, resolved, That the President of this Association appoint a committee, whose duty it shall be to make an earnest effort through our next legislature to have an appropriation, if such is necessary, sufficient to defray the expense of the publication of the said report, and not less than three thousand copies be printed.

J. B. PHELPS,
JOHN FOX,
S. N. CHASE,
Committee.

Report of Committee of Audit.

We have made an examination of the books and vouchers of the Secretary and Treasurer, and find them to be correct, which we respectfully submit.

G. D. HEATH,
M. G. BEATTY,
Committee.

Report of Committee on Membership.

Your committee find that so much liberality has been practiced by the Association towards all those who have attended our meetings, regardless of membership, that the incentives to become enrolled have been reduced to a minimum. Yet, we find that the pride of the American citizen in his institutions is keenly alive; and, appealing to this patriotic appreciation of our society, the following farmers and dairymen have been enrolled as members

C. B. McDowell, Dicksonburg, Pa.
A. D. Root, Bear Lake. Pa.
R. P. Beatty, Cleveland, O.
Frank Mantor, Conneautville, Pa.
Andrew Bossard, Meadville, Pa.
A. W. Wall, Espyville, Pa.
Wm. M. Ross, Centerville, Pa.
W. A. Porter, Freehold, Pa.
Chas. Proctor, Ovid, Pa.
H. S. Matteson, Morris, N. Y.
J. D. Philips & Son, Warren, Pa.
J. H. Garwood, Dicksonburg, Pa.
A. H. Olmstead, Spring Creek, Pa.
John Almon, Meadville, Pa.
Arthur C. Sears, Freehold, Pa.
C. R. Slocum, Meadville, Pa.
A. W. Neadean, Harmonsburg, Pa.
W. Dart, Hayfield, Pa.
E. A. Elston, Spartansburg, Pa.
A. J. Aikens, Spartansburg, Pa.
C. S. Clark, Meadville, Pa.
A. Kahler, Meadville, Pa.
S. Niedeveiter, Marble, Clarion county, Pa.
Mrs. Emily L. Judd, Meadville, Pa.

T. M. McKINNEY,
G. H. St. JOHN,
BENJ. CULP,
Committee.

Report of Committee on Intelligence and Nominations.

Your committee respectfully report: Persons seeking situations as cheese makers:—

E. O. Biggin, three years experience.
Charles Douglas, J. L. Wykoff as reference.
P. R. Cooper, of Rundells, Pa.

Nominations.

First Vice President, J. C. McClintock, Crawford county, Pa.
Second Vice President, Hon. J. C. Sibley, Venago county, Pa.
Third Vice President, George M. Orris, Crawford county, Pa.
J. B. Phelps, Crawford county, Pa.
M. L. Freeman, Crawford county, Pa.
John S. Kean, Crawford county, Pa.
L. C. Magaw, Crawford county, Pa.
Henry Port, Erie county, Pa.
A. L. Wales, Erie county, Pa.
W. T. Everson, Erie county, Pa.
Wm. Marsh, Erie county, Pa.
Chas. Lott, Warren county, Pa.
H. S. James, Venango county, Pa.
T. S. Strohecker, Venango county, Pa.

F. J. Forker, Mercer county, Pa.
T. J. Mellinger, Lancaster county, Pa.
Thomas Magee, Centre county, Pa.
Wm. Darlington, Chester county, Pa.
R. S. Caldwell, Washington county, Pa.
Jos. Dillingham, Montgomery county, Pa.
Leonard Rhone, Centre county, Pa.
J. M. Shields, Jefferson county, Pa.

GEORGE SPITLER,
C. W. HEYDRICK,
Committee.

REPORT OF COMMITTEE ON UTENSILS, BUTTER EXHIBIT, ETC.

Mr. President: Your committee would respectfully submit the following report:

Butter Salt.

Mr. R. P. Beatty, representing the United Salt Company, of Cleveland, Ohio, at the request of the convention, called attention to the chemically pure salt manufactured by the company he represents, branded "Renown." He made some interesting tests showing the presence of lime and magnesium, which are found in all salts not chemically pure.

The salts tested were the Renown, Genessee, Worcester, and Diamond Crystal. The Renown showed no trace of lime, the Diamond Crystal a slight trace, while both the others showed a very considerable quantity by comparison.

A barrel of salt of the Vacuum Pan Dairy Salt brand was on exhibition, being examined by many dairymen, who remarked the fineness of grain and readiness to dissolve. The exhibitor was R. M. Boyd, of Raccine, Wis.

The Vermont Farm Machine Company exhibited a United States Cream Separator, dairy size, with rated capacity of 300 pounds of milk per hour; and a Babcock Milk Tester, which did godo service on the public platform in the hands of Mrs. Kate M. Busick, who made a practical explanation of the test. This separator was not tested for lack of milk, but the agent claimed for his machine, strength, durability, and perfect work. The separated milk comes out at the bottom instead of at the top. We believe the merits claimed for it are justified.

The DeLaval Baby Cream Separator No. 2, was on exhibition, and attracted merited attention. This is a well-known and very excellent machine. The agent claimed that it required less power to run than any other machine, with a motion one-third lower. The machine was not operated.

The Columbia Separator was accompanied by a boiler and engine. This seemed to be something new, and won its share of attention. There are three sizes, the one on exhibition being No. 2, with a capacity of 300 pounds of milk per hour. One special feature claimed for this separator is its immunity from danger of bursting while in operation, as the bowl is made of aluminum. There are three pieces composing it, which renders it easy to clean. There is no cream slot to churn the cream. The cream from the center flows over a smooth surface on the top of the bowl. This machine was tested with interest to members, and satisfactory results to the committee.

There was another machine on exhibition which, though not a dairy utensil was interesting to all. It was a Webster and Hannum Bone Mill, for the purpose of grinding green bones for poultry. It reduced the bones to a fine consistency by a cutting, rather than a grinding process, and we should judge that the machine is capable of all that is claimed for it; and that its use must increase the production of eggs by a flock of fowls, and stimulate growth in young chicks.

Butter Exhibit.

The butter exhibit consisted of 22 entries, 18 of which were entered for premiums. The premiums consisted of $30 in cash; a Jersey heifer calf, value $50, by John C. McClintock, president of the Association; and a lady's saddle, value $8, by J. C. Smith and Son, dealers in harness, horseman's goods, and Gennesee salt.

The entries were in five pound packages, as follows:—

1. John H. Rupert, Woodcock, Pa.
2. W. A. Porter, Freehold, Pa.
3. W. M. Ross, Centerville, Pa.
4. A. D. Root, Bear Lake, Pa.
5. Charles Proctor, Ovid, Pa.
6. W. H. Cooley, Meadville, Pa.
7. O. E. Burwell, Espyville Station, Pa.
8. E. Swaney, Cooperstown, Pa.
9. H. C. Crawford, Cooperstown, Pa.
10. C. B. McDowell, Dicksonburg, Pa.
11. R. S. Hartley, Freehold, Pa.
12. John Fox, Meadville, Pa.
13. J. B. Phelps, Conneautville, Pa.
14. J. H. Reynolds, Meadville, Pa.
15. T. T. Root, Cambridgeboro', Pa.
16. A. J. Bossard, Meadville, Pa.
17. L. A. Tucker, Cambridgeboro', Pa.
18. J. H. Garwood, Dicksonburg, Pa.
19. A. L. Wales, Corry, Pa.

Sample from J. D. Phillips and Son, of Warren, Pa., arrived too late for competition.

SCORES.

Made by Profs. H. B. Gurler and W. H. Caldwell, of the State College, acting as judges.

Standard.	Flavor, 45.	Grain, 25.	Color, 15.	Salt, 10.	P'k'g, 5	Total, 100.
No. 1. J. H. Rupert, . . .	35	22	7	9½	5	78½
No. 2. W. A. Porter, . . .	40	22	13	9½	5	89½
No. 3. W. M. Ross, ...	40	20	7	9	5	81
No. 4. A. D. Root, . . .	40½	23	14	10	5	93½
No. 5. Charles Procter, . .	42	23	14	10	5	94
No. 6. W. H. Cooley, . . .	43½	22½	14½	10	5	95½
No. 7. O. E. Burwell, . . .	41	22½	8	9	5	85½
No. 8. E. Swaney, ...	35	20	10	9	5	79
No. 9. H. C. Crawford, . .	40	22	12	9	5	88
No. 10. C. B. McDowell. . .	41	23½	14	10	5	93½
No. 11. R. S. Hartley, . . .	41½	22½	14	9½	5	92½
No. 12. John Fox.	36	23	13½	9½	5	87
No. 13. J. B. Phelps. . . .	41	22½	13½	9½	5	91½
No. 14. J. H. Reynolds, . .	35	22½	10	9½	5	82
No. 15. T. T. Root.	41	22	12½	9½	5	90
No. 16. A. J. Bossard, . . .	35	20	13½	9½	5	81
No. 17. L. A. Tucker, . . .	37	22½	14	10	5	88½
No. 18. J. H. Garwood, . .	41	22½	10	9	5	87½
No. 17. A. L. Wales, . . .	42	22	14½	9½	5	93

All of which is respectfully submitted,

O. E. BURWELL,
H. E. WRIGHT,
D. H. LEFEVER,
Committee.

Treasurer W. W. Dean made report. Was absent at the opening session.

Accepted and placed in the hands of auditing committee.

Mr. Phelps. I move that this convention send a delegate to the Dairy Union at Chicago to meet soon.

Motion seconded.

Mr. Matteson. I nominate John McClintock to go as delegate to this convention.

Seconded.

Carried.

J. B. Phelps called attention to the case of a dairyman named Walls, of Espyville, who was arrested for running his cheese factory on Sunday. Why can others?

G. H. St. John said it was unwise to oppose the State law.

Mr. Phelps presented a resolution asking that the State Legislature repeal the law prohibiting dairymen from doing necessary work on the Sabbath day.

After discussion. D. H. Lefever moved that the resolution be placed in the hands of a committee, to report at next meeting.

After various amendments, the motion, as amended, was laid on the table.

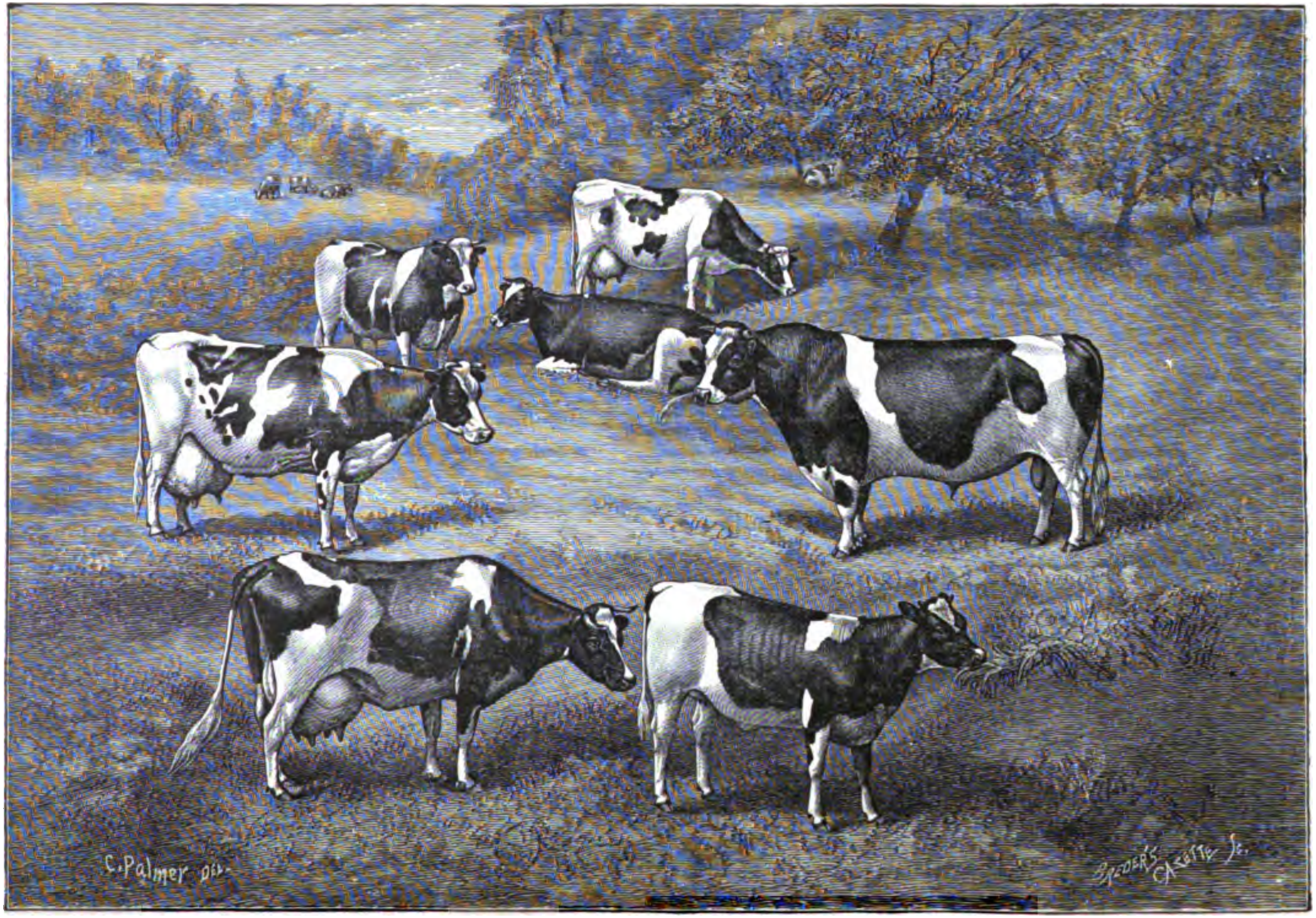
Election of Officers.

President, H. C. Crawford.

G. H. St. John was re-elected secretary.

M. G. Beatty, of Mead township, was elected treasurer.

J. C. McClintock was chosen first vice president, G. M. Orris second vice president, and J. C. Sibley third vice president.


C. Palmer del.
Breeder's Gazette Sc.

VIOLET. VIOLET KING. VIOLET BELLADONNA. VIOLET PRINCE.
VIOLET VERBENA. VIOLET II. VIOLETA.

A BRIEF DESCRIPTION

OF

SOME FAMOUS CATTLE.

ILLUSTRATED.

PURE DAUNCEY COW, MATILDA FOURTH, 12816.

(Dropped March 29, 1880.)

Dark fawn, shading to iron gray; black tongue; black switch.

Sire, Stoke Pogis, 1259, Imp. Dam, Matilda, 3238, Imp.

Matilda 4th, 12816, gave as high as sixty pounds of milk per day, and a total of 16,153¾ pounds for one year ending April 6, 1886. During the year of her record, her milk was set 144 days in eleven different months. In May she made on very light feed, nineteen pounds nine and a half ounces butter in seven days. In June she showed at the rate of twenty-six pounds four ounces. In July she made an official test of twenty-one pounds eight and a half ounces. The weather during this test, was the most sultry and oppresive, and the flies the most annoying of any time during the year. The pasture woodland hill-side was dried up. In September she showed at the rate of twenty-two pounds twelve ounces. During the last 125 days of the year, she made two hundred and seventy-nine pounds seven and one-half ounces of butter an average of over 15 pounds 10 ounces per week. Included in this latter period was the month of January, the tenth month after calving, seventy-three pounds one and one-half ounces. The butter was of a high quality, firm, salted one ounce to the pound, well worked and ready for market. For the year the records indicate that she made fully 950 pounds of butter.

She has over ninety-two per cent. of blood elements found in Stoke Pogis 3d, 2238; and Stoke Pogis 5th, 5987. Stoke Pogis 3d sired twenty-seven cows tested for butter, and averaging over twenty pounds a piece per week. Among them are Mary Anne of St. Lambert, 867 pounds 14¾ ounces in 340 days, and Ida of St. Lambert, sixty-seven pounds of milk per day and an official test of thirty pounds two and a half ounces of butter in seven days; Stoke Pogis 5th has had twenty-one young daughters tested, making from fourteen pounds one and one-half ounces to twenty-four pounds fourteen and one-half ounces.

Stoke Pogis, 1259 imp., the sire of Matilda 4th, also sire La Petite Mere 2d, 12810, who gave fifty-seven pounds of milk per day, and 16,699½ pounds for the year ending November 2, 1886. She was fed rather for flow of milk than for richness, and furthermore, her milk was not begun to be set continuously until a month and a half after calving, and thus the most valuable time was lost, nevertheless, in 365 consecutive days from the beginning of the test she made 660 pounds 4 ounces of butter. He also sired an unregistered cow, owned by Dr. W. S. Webb, Burlington, Vermont, that tested in the winter of 1886-87, as to a ten year old on ordinary feed, fifty pounds of milk per day, and sixteen pounds eight ounces butter in seven days.

Matilda, 3238, her dam and her great-great-granddam were each seventeen pounds cows. Matilda, 3238, was also the dam of Matilda 5th, 18068, test twenty-one pounds six ounces. Matilda 2d, 5471 and Matilda 3d, 12808, two full sisters of Matilda 4th, were the dams respectively of Minnie of Oxford, 12806, test seventeen pounds, and Mintha, 12812, test, fifteen pounds.

This picture of Matilda 4th does not show her at her best, as it was taken when she was in winter coat, the year following her great yield, and nearly three months after calving, when giving only about forty-five pounds of milk per day.

Property of Miller & Sibley, Franklin, Venango county, Penna.

EXILE OF ST. LAMBERT THIRTY-THIRD, 23,092.

At Two Years Old.

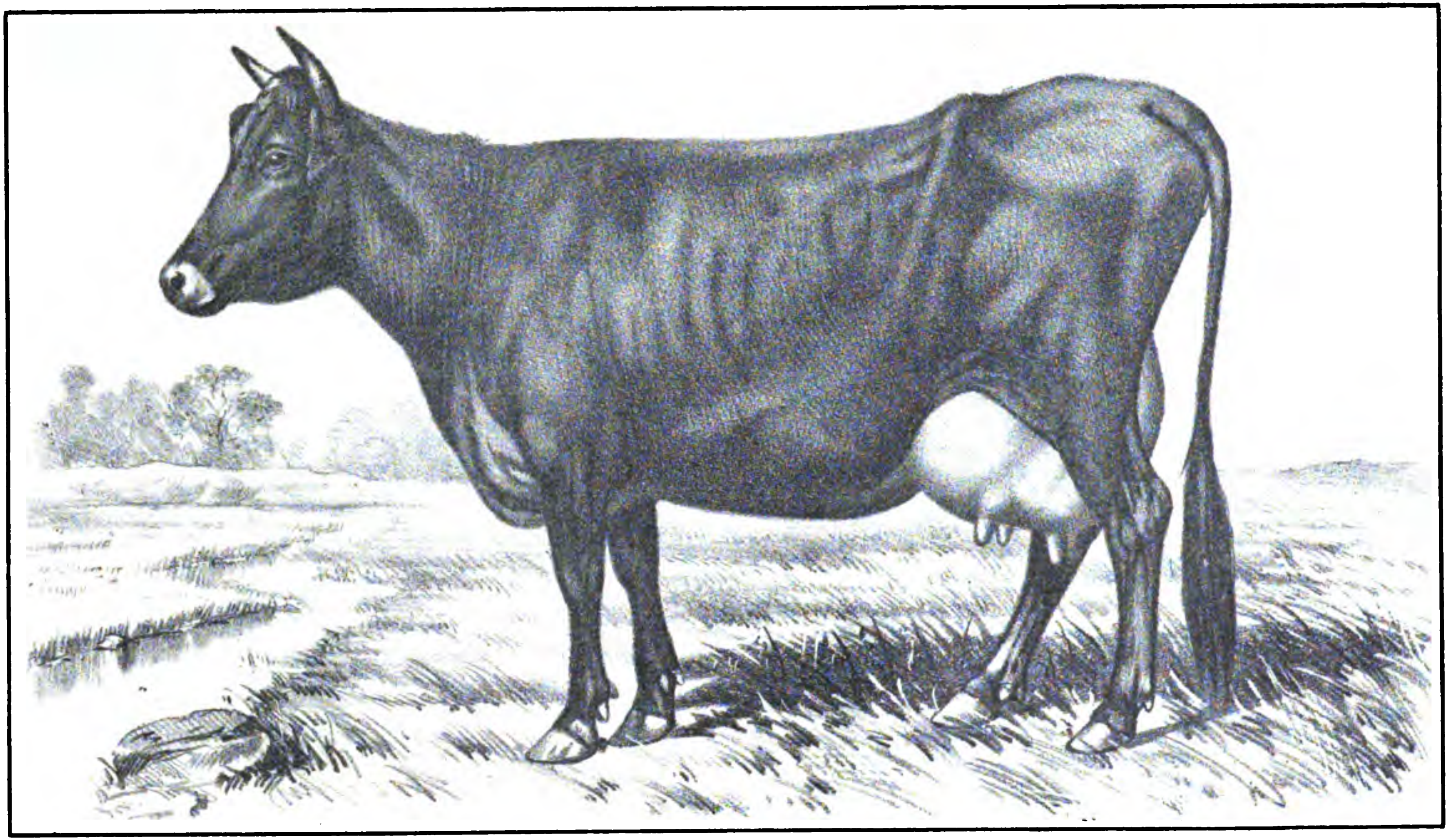
Exile of St. Lambert, thirty-third, 23092. Sire Exile of St. Lambert, 13657. Dam, St. John's Daisy, 28388 Improvement. Fifteen pounds three ounces. Dam of Paola Stoke Pogis, twenty-three pounds; Exile's Bessie, eighteen pounds, twelve and a half ounces; Exile's Mary, fifteen pounds, four and a half ounces, at two years old.

Copy.

Exile thirty-third has served one hundred and thirty-six cows outside of my own herd, one hundred and thirty-four having calves, fully two-thirds of the calves were heifers, and nearly all solid color and light fawns, some squirrel gray and the various shades of fawn. In my own herd he has sired thirty calves, twenty-four of them heifers, at three years he weighed 1,570 pounds and is perfectly sound and smooth, not a bunch of any kind on legs or any part of him. As yet he is perfectly kind and quiet just as much so as a six months' calf.

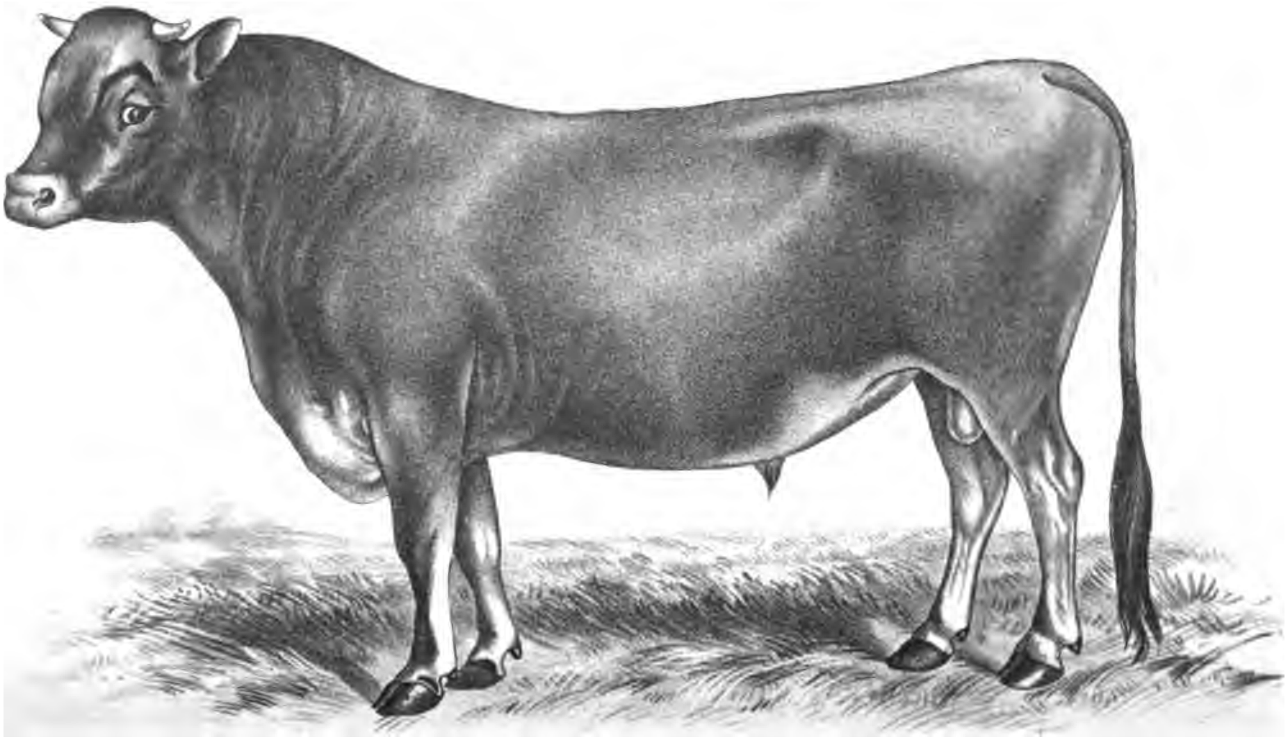
The only motive to part with him, is the fact that this fall my herd will be nearly all his calves, and to avoid inbreeding.

Yours truly,
PETER FAILING, M. D.



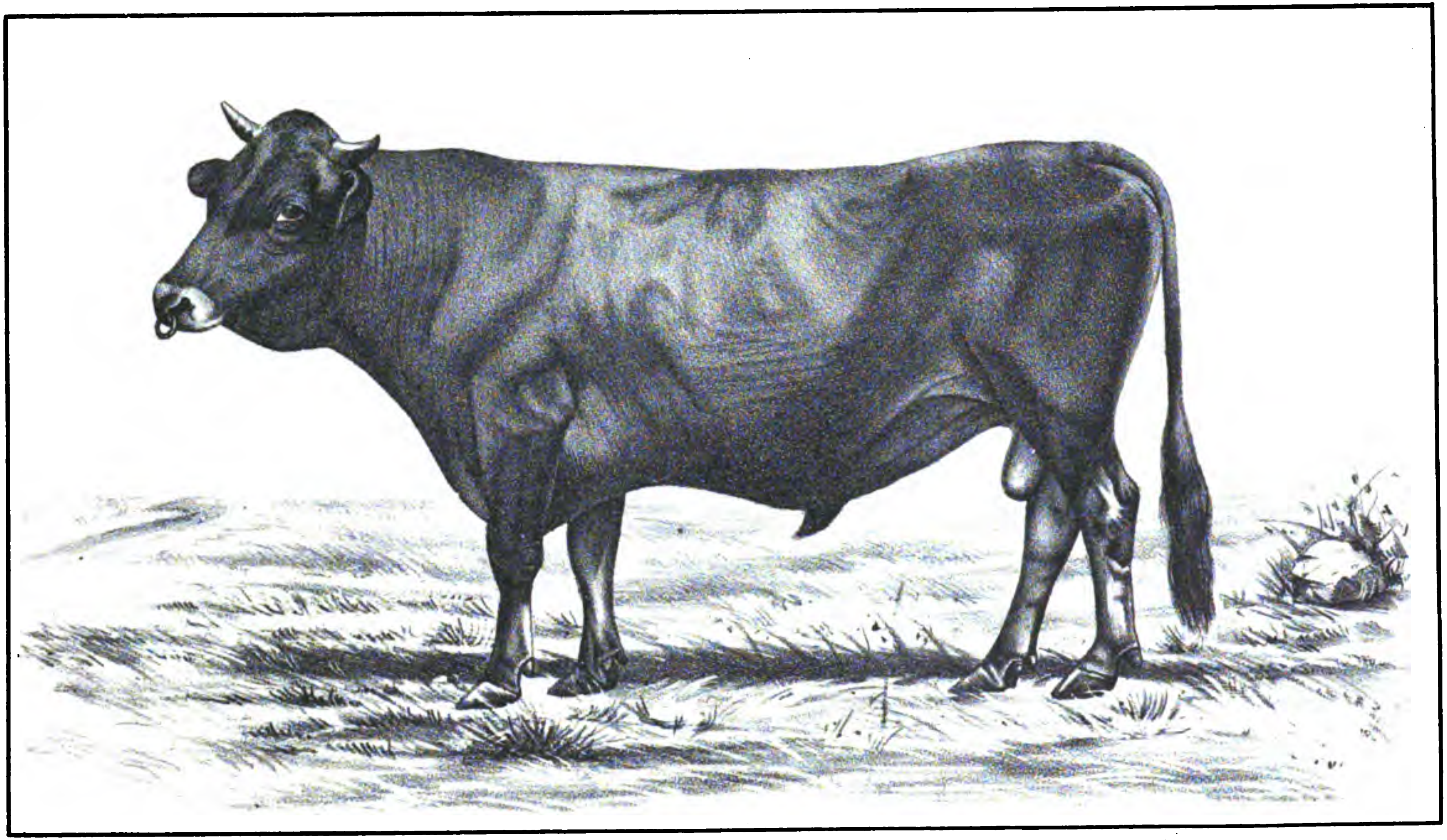
MATILDA 4th, 12816.

When 6 years, 11 months old. Taken in winter coat.

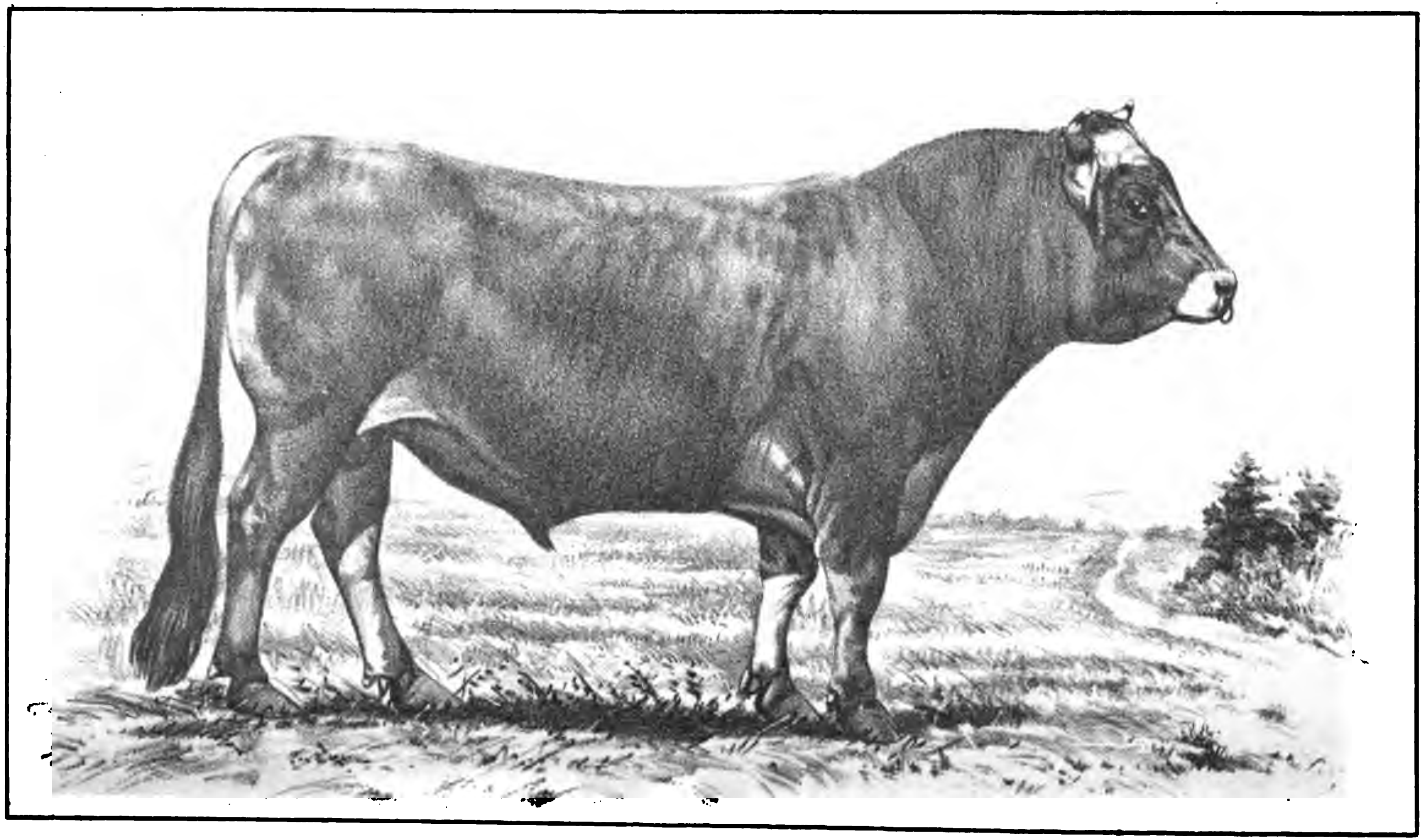


EXILE OF ST. LAMBERT, 33rd, 28092,

At 2 years old.



STOKE POGIS, 5th, 5987.



Registered Jersey Bull, IDA'S RIOTER of St. L., 18656,

STOKE POGIS FIFTH, 5987.

(Not Living.)

Stoke Pogis fifth, 5987, Sire, Stoke Pogis 1259, Imp., dam. Marjoram, 3239, Imp. Solid dark fawn, black tongue and black switch.

Stoke Pogis fifth is generally considered to have been one of the greatest bulls in the Jersey breed. Miller & Sibley once refused $15,000 for him. He sired twenty-one cows that have full weekly butter tests, as follows:

Butter Tests of Daughters of Stoke Pogis Fifth, 5987.

Name.	*Age when tested.*	*Amount for 7 days.*	
		Lbs.	*Ozs.*
Sister of Charity,		24	14½
Careta (2d calf),	3 years,	22	12
May Dee Pogis,		20	5½
Lady Mary of Prospect (2d calf),	3 years,	19	15½
Priscilla Pogis (2d calf),		18	6½
Frankness (1st calf),	3 years (nearly),	18	4
Pogis May (2d calf),	3 years,	18	2
Candelabrum,		17	13
Pauletta Pogis,		17	12
Princess Aurea Pogis,		17	7½
Pretty Patty,		17	1
Mary M. Pogis,		16	4½
Sweet Blossom Pogis (2d calf),		16	1½
Little Pogis,		16	1
Mary Hinman (2d calf),	3 years,	15	11½
Sterling Merit (1st calf),	3 years (nearly),	15	4
Rho. A. Pogis,		14	15
Pomona's Ida of St. L.,		14	14½
Rioter's Zoe,		14	12
Gilfilia Pogis,		14	2½
Sweet Leona B.,		14	1½

Stoke Pogis fifth was a full brother of Stoke Pogis third, whose twenty-seven daughters tested for butter average over twenty pounds a piece per week.

REGISTERED JERSEY BULL, IDA'S RIOTER OF ST. L., 13656.

Sire, Bachelor of St. Lambert, 4558. Dam, Ida of St. Lambert, 24990. Record, four hundred and fifty-five pounds, eight ounces milk; thirty pounds two and a half ounces butter in seven days.

Solid silver-gray color, dark shadings, black tongue, heavy black switch, typical massive, Rioter head, thick short horns, long body, straight back, wide loins and hips, deep, capacious barrel, short, stout legs, rich yellow, mellow skin, kind disposition. He has weighed as high as 1760 pounds. His dam's official butter test of thirty pounds two and a half ounces in seven days was made with but little previous preparation. For thirty-one consecutive days in December, '85, and January, '86, she gave a total of 1891 pounds of milk. Her best day was sixty-seven pounds, and her best seven days, 455½ pounds. This record still remains unequalled, we believe, in the Jersey breed.

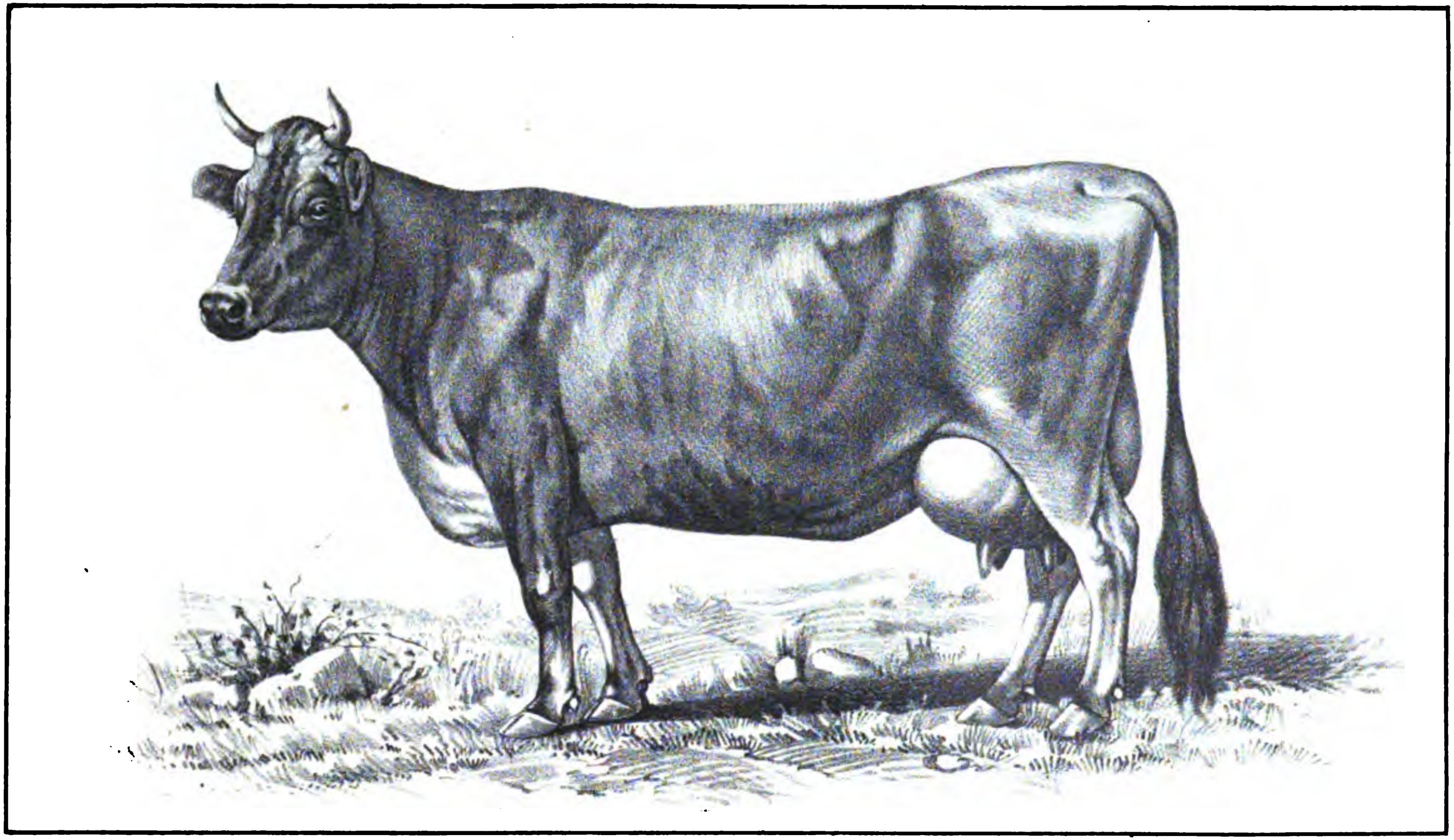
On his dam's side Ida's Rioter of St. L. is a grandson, and on his sire's side, he is a grandson of Stoke Pogis 3d, sire of Mary Anne of of St. Lambert, 867 pounds 14¾ ounces of butter in 340 days, and twenty-six other great butter yielders, the twenty-seven averaging over twenty pounds a piece per week. The daughters of Ida's Rioter of St. L., have symmetrical udders, full for udders large, well-placed teats, and many of them give in their flush from forty to fifty pounds of milk per day on ordinary feed. The following daughters have full weekly butter tests, namely—Ida Marigold, twenty-five pounds two and a half ounces (50 pounds in fourteen days); Daisy Hinman, twenty-four pounds ten ounces (102 pounds in thirty-one days); Ida Twinkle, twenty-three pounds two and a half ounces; Experience, twenty-two pounds thirteen ounces; St. Lambert Crescent, twenty-two pounds ten ounces; Ida Evas Pogis, eighteen pounds six ounces; Highland Ida, eighteen pounds one and a half ounces; Helpmeet, seventeen pounds fifteen and a half ounces; Friendship, seventeen pounds three ounces (two years); Ida Zoe Pogis, sixteen pounds two and a half ounces; Rioter's Violet Pogis (three years), fourteen pounds fifteen ounces; Matilda of Meridale (three years), fourteen pounds fourteen ounces.

Owned by Miller & Sibley, Franklin, Venango county, Pa.

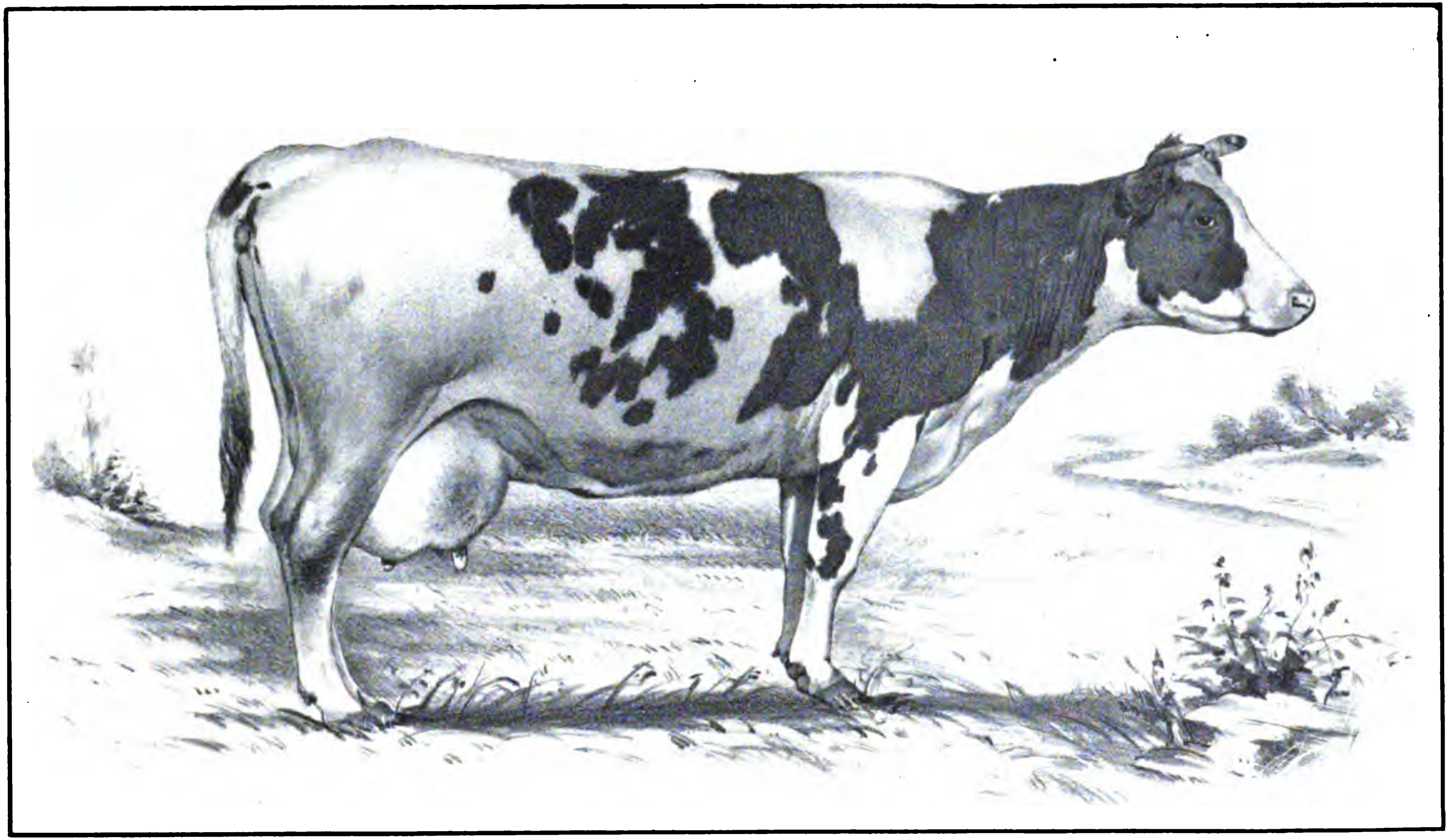
Butter Tests of Daughters of Ida's Rioter of St. L., 13656.

Name.	*Age when tested.*	*Amount for 7 days.*	
		Lbs.	*Ozs.*
Fable,		26	5¼
Ida Marigold (2nd calf),		25	2½
Daisy Hinman,		24	10
Ida Twinkle,		23	2½
Experience,	4 years,	22	13
St. Lambert Crescent,		22	10
Good Advice,	4 years, 10 months,	19	5½
Ida Eva Pogis (1st calf),		18	6
Ribbon of St. Lambert,		18	2
Highland Ida,		18	1½
Helpmeet (2nd calf),	3 years, 10 months,	17	15½
The Queen's Gift (1st calf),	3 years,	17	11
Friendship (1st calf),	2 years, 9 months,	17	3
Snow Bank (1st calf),	2 years, 11 months,	16	7
Dew (2nd calf),	4 years, 3 months,	16	7
Ida Zoe Pogis,		16	2½
Rioter's Violet Pogis (1st of),	3 years,	14	15
Crown (1st calf),	2 years, 11 months,	14	14½
Matilda of Meridale,	3 years, 7 months,	14	14

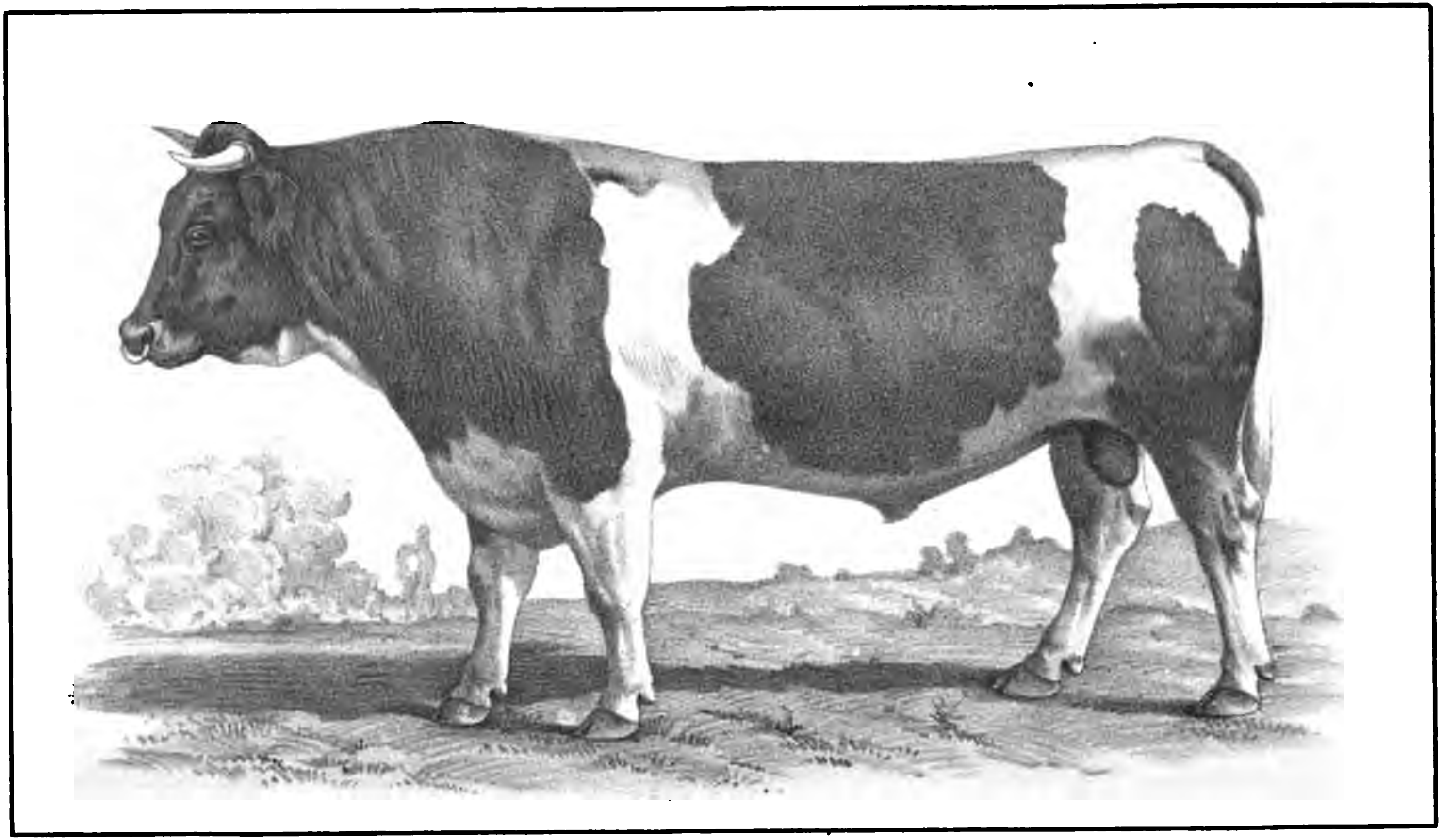
Still Living.



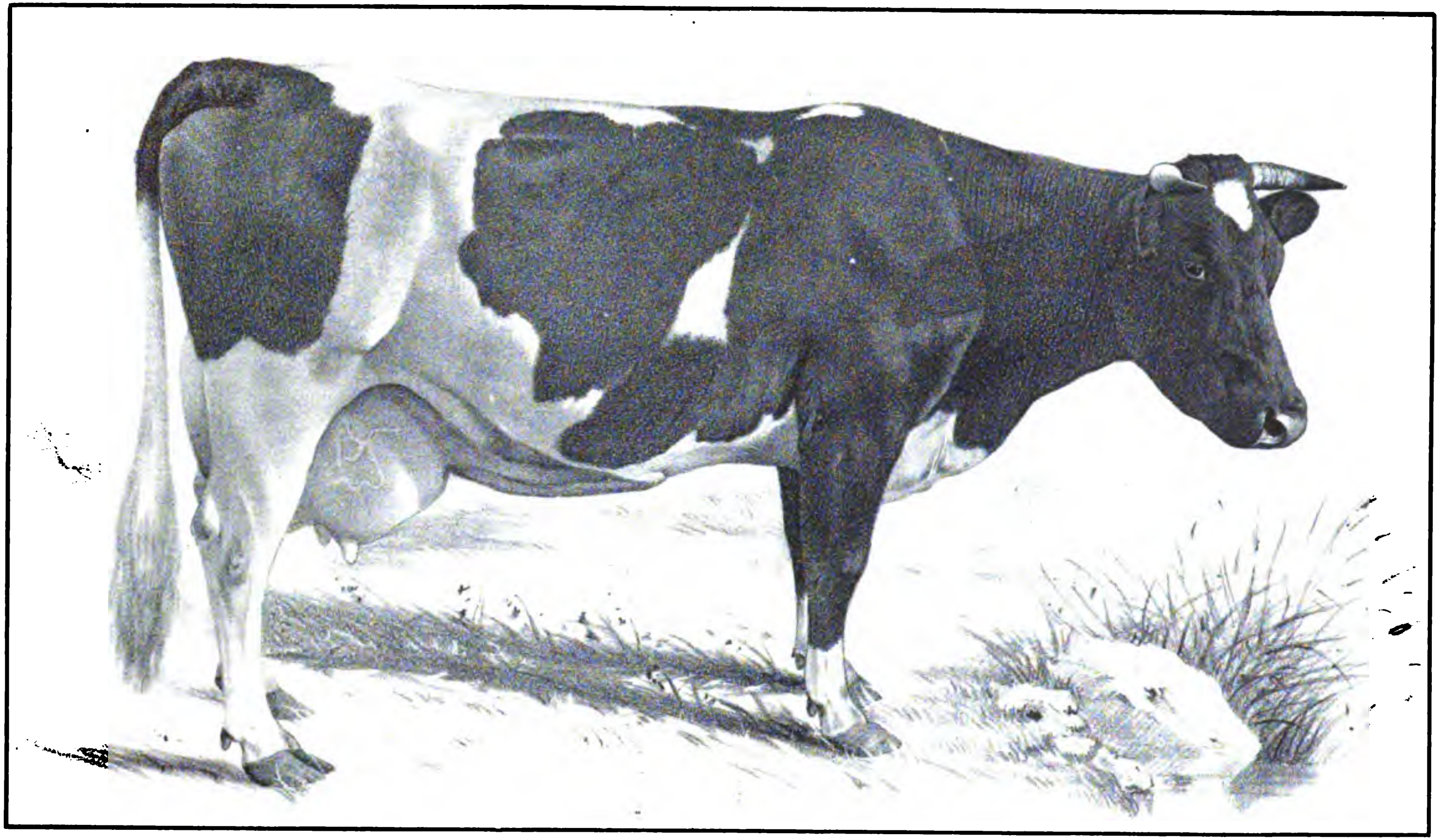
Jersey Cow, IDA OF ST. LAMBERT, 24990.



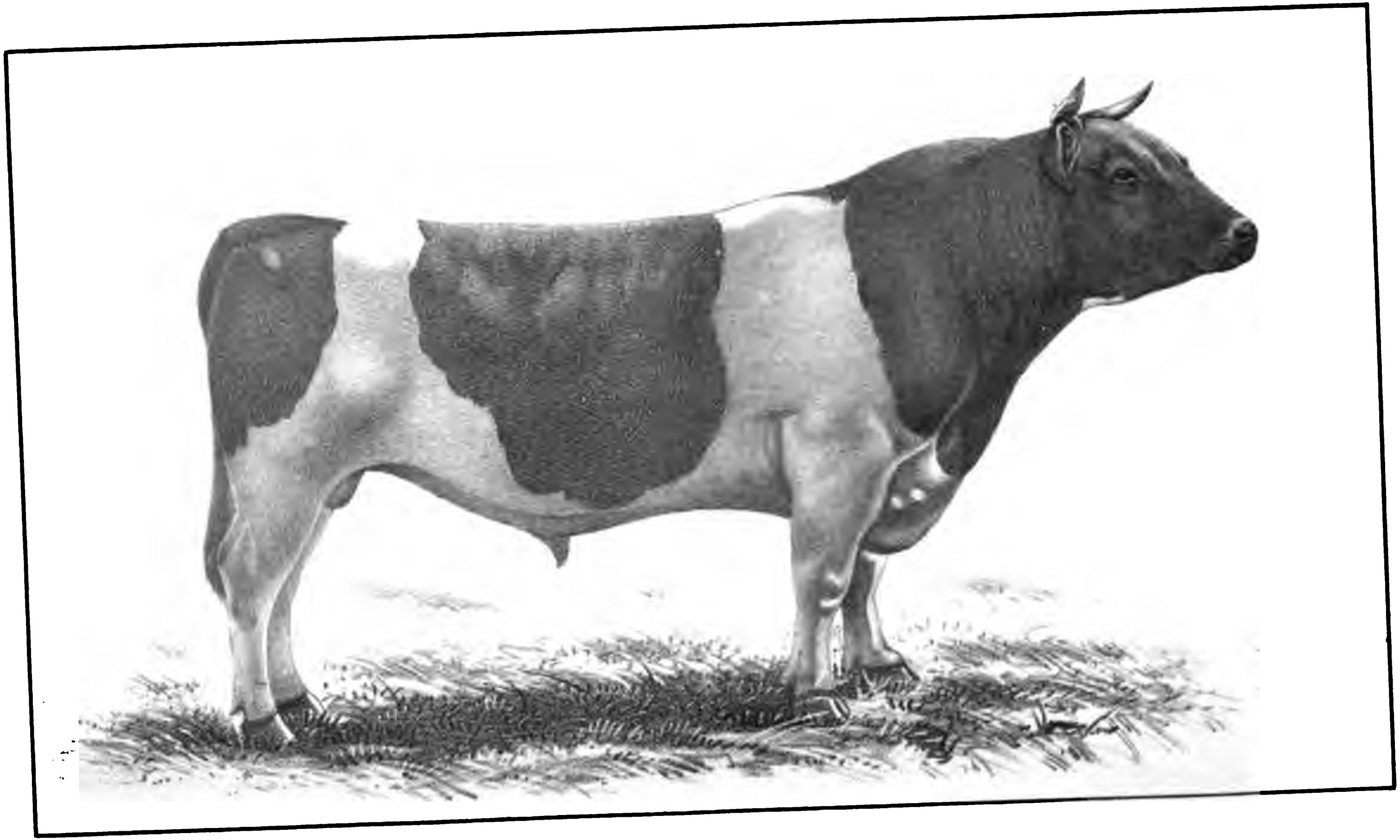
VIOLET, No. 748, H. H. B.



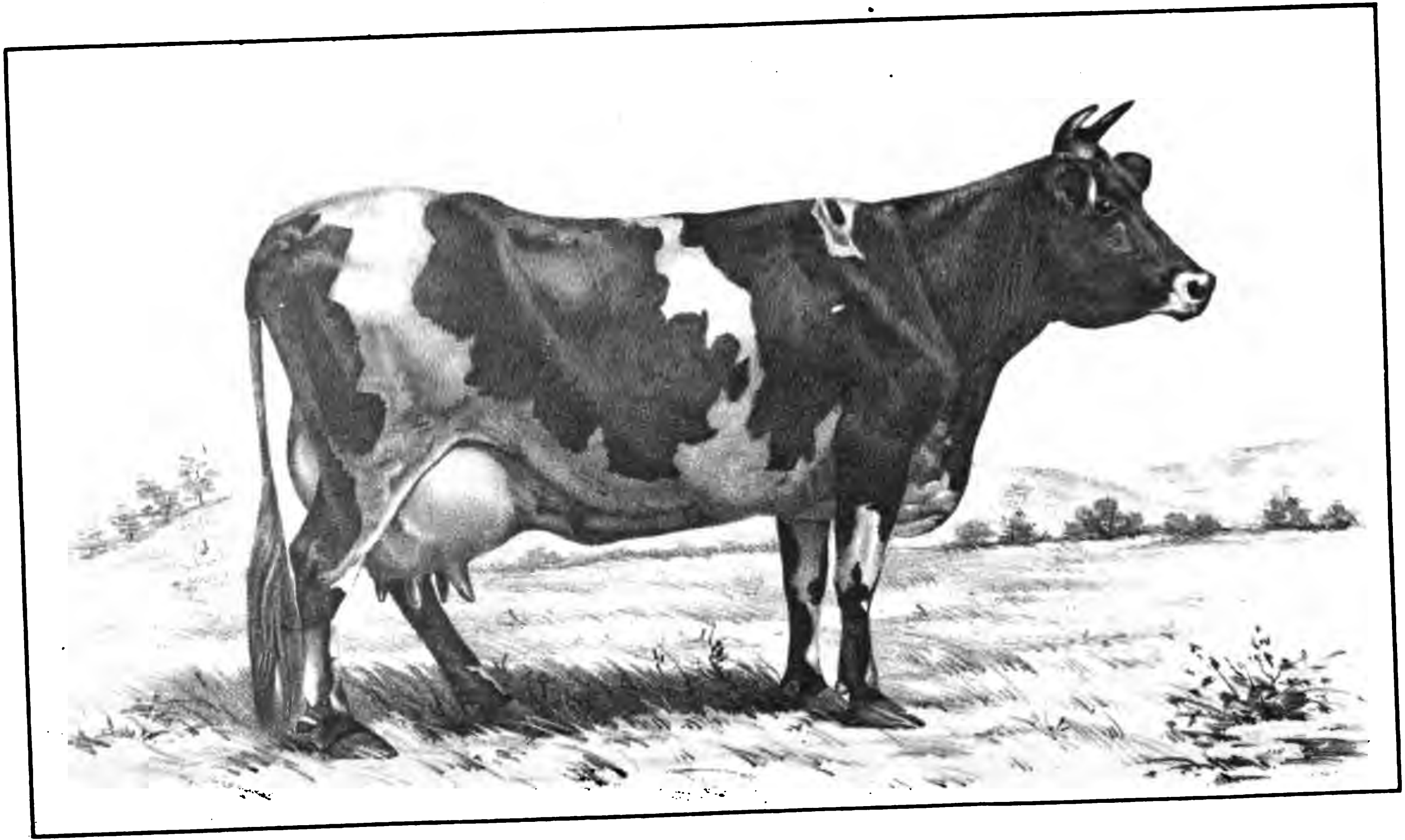
DE BRAVE HENDRIK, No. 199, N. R. S., 280, H. F. H. B.



CYBELE, No. 5291, H. H. B.



BILLY BOELYN, No. 189, H. H. B.



IDA MARIGOLD, 82615.

JERSEY COW, IDA OF ST. LAMBERT, 24990.

Sire, Stoke Pogis 3d, 2238. Dam, Kathleen of St. Lambert, 5122.

Solid silver gray color, black tongue, black switch; weight, 1075 pounds.

Butter test, thirty pounds two and a half ounces for the seven days ending September 18, 1886, before a committee appointed by the American Jersey Cattle Club, beating the best previous record by over two and a half pounds, though she had but little conditioning.

Milk record, 1,891 pounds for thirty-one consecutive days in December, '85, and January, '86; best day sixty-seven pounds, best seven days, 455½ pounds This record although made so long ago, and in winter, still remains, we believe, unequalled in the Jersey breed. We paid for her, before she was tested, $6,500 cash.

Her sire, Stoke Pogis 3d, sired also Mary Anne of St. Lambert, 867 pounds 14¾ ounces butter in 340 days, and twenty-five other great butter makers, the average of the twenty-seven being over twenty pounds a piece per week. Stoke Pogis 5th, a full brother of Stoke Pogis 3d, sired Sister of Charity, twenty-four pounds fourteen and a half ounces and twenty other high-tested young cows. Stoke Pogis, 1259, imp., the sire of Stoke Pogis 3d and Stoke Pogis 5th, sired the famous cows Matilda 4th and La Petite Mere 2d, each of whom gave over 16,000 pounds of milk in a year.

Ida of St. Lambert's son, Ida's Rioter of St. L., 13656, owned by Miller & Sibley, sired Ida Marigold, twenty-five pounds two and a half ounces butter in seven days (fifty pounds in fourteen days); Daisy Hinman, twenty-four pounds ten ounces (102 pounds in thirty-one days); Ida Twinkle, twenty-three pounds two and a half ounces; Experience, twenty-two pounds thirteen ounces; St. Lambert Crescent, twenty-two pounds ten ounces, and fourteen other high-tested cows.

Property of Miller & Sibley, Franklin, Venango county, Pa.

IDA MARIGOLD, 32615.

Sire, Ida's Rioter of St. L., 13656. Dam, Arawana Marigold, 9380. Butter records for Miller & Sibley, twenty-five pounds two and a half ounces in seven days. Fifty pounds in fourteen days.

At World's Columbian Exposition, Chicago, 1893, her record was:

Sweepstakes prize in Jersey show ring. (A host of competitors.)

Sweepstakes prize in fifteen-day Cheese Contest. (Three breeds competing.)

Biggest Butter Yield for the seven days ending July 1.

Highest Jersey Milk Record for a single day.

Second Highest Jersey Milk Record for the entire period of the tests, May 11 to September 27, of the "Best Five Cows of Any Breed" for dairy purposes. (All Jerseys.) Highest Total Milk Record of any cow that reached home alive.

Second Greatest Net Profit for the combined period of the fifteen-day Cheese Contest and the ninety-day Butter Contest. Greatest Net Profit of any cow that reached home alive.

Bred by Miller & Sibley, Franklin, Venango county, Pa.

VIOLET.

No. 743 H. H. B.

Calved March, 1877 (imported.)
Color, black and white; tiger spotted.
Bred October 19, 1891, to Pietertje Chief, 13402, H. F. H. B.
Record, 86¾ lbs. 18,677¼ lbs. in one year.
19 lbs. 9 oz. butter in 7 days.
Property of Edgar Huidekoper, Meadville, Pa.

DE BRAVE HENDRIK.

No. 199, N. R. S., 230, H. F. H. B.

Bred by K. Helder, Zuid Schermer, N. H.
Calved March 28, 1880 (imported.)
Won the following prizes abroad:
Committee prize, Alkmaar, March, 1882.
Committee prize, Holland Agricultural Society, Gouda, September, 1882.
Prize bull, Alkmaar, August, 1883.
First prize, International Agricultural Exhibition, Amsterdam, August, 1884.

In March, 1883, the Committee of Agriculture selected fifty bulls in Holland, and from those fifty selected and designated De Brave Hendrik as the first and best bull to stand in North Holland.

De Brave Hendrik comes from a great milking family. He indicates the great milk tendency in his breeding, and imparts to his heifers perfect model udders. He gets good milkers and butter cows.

CYBELE.

No. 5291, H. H. B.

Bred by W. Groot, Schermerhorn, N. H.
Calved March, 1883 (imported.)
Sire, Herman.
Dam, Nina, 32 litres.
Color, black; white star, white on left shoulder; white stripe over hips.
Bred January 27, 1892, to Pietertje Chief, 13402, H. F. H. B.
Record, 100½ lbs. 13,031⅞ lbs. in one year.
15 lbs. 8 oz. butter in 7 days.

BILLY BOELYN.

No. 189, H. H. B. (Dead—for reference.)

As a model Holstein bull he is only equalled by De Brave Hendrik. As a sire of model bulls and cows of fine form and of great milking merit, he is equally a noted success.

Billy Boelyn, with his herd, winner of the Gold Medal Prize for best herd at New York State Fair, 1880.

First prize, Ohio State Fair, 1882.

First prize, Pennsylvania State Fair, 1882.

First prize, best bull of any age, Pennsylvania State Fair, 1882.

First prize, sweepstakes herd (one bull and four cows), Pennsylvania State Fair, 1882.

First prize, Mahoning and Shenango Valley Fair, 1882.

First prize, sweepstakes, best herd, Mahoning and Shenango Valley fair, 1882.

First prize, sweepstakes herd (one bull and four cows), Ohio State Fair, 1883.

First prize, best bull, three years old and over, Tri-State Fair, 1883.

First prize, best herd (one bull and four cows), sweepstakes, Tri-State Fair, 1883.

First prize, best herd, sweepstakes, Mahoning and Shenango Valley Fair, 1883.

The bulletin of the Ohio State Board of Agriculture for 1892, reports: "Before entering upon the examination of this breed, the awarding committee agreed upon the following rules, by which their decision would be guided:

"1st. Considered in their relation to the dairy.

"2d. Considered in their relation to the shambles. Any animal, in their judgment, combining the greatest amount of excellence, viewed from this standpoint, would be entitled to the first premium, etc.

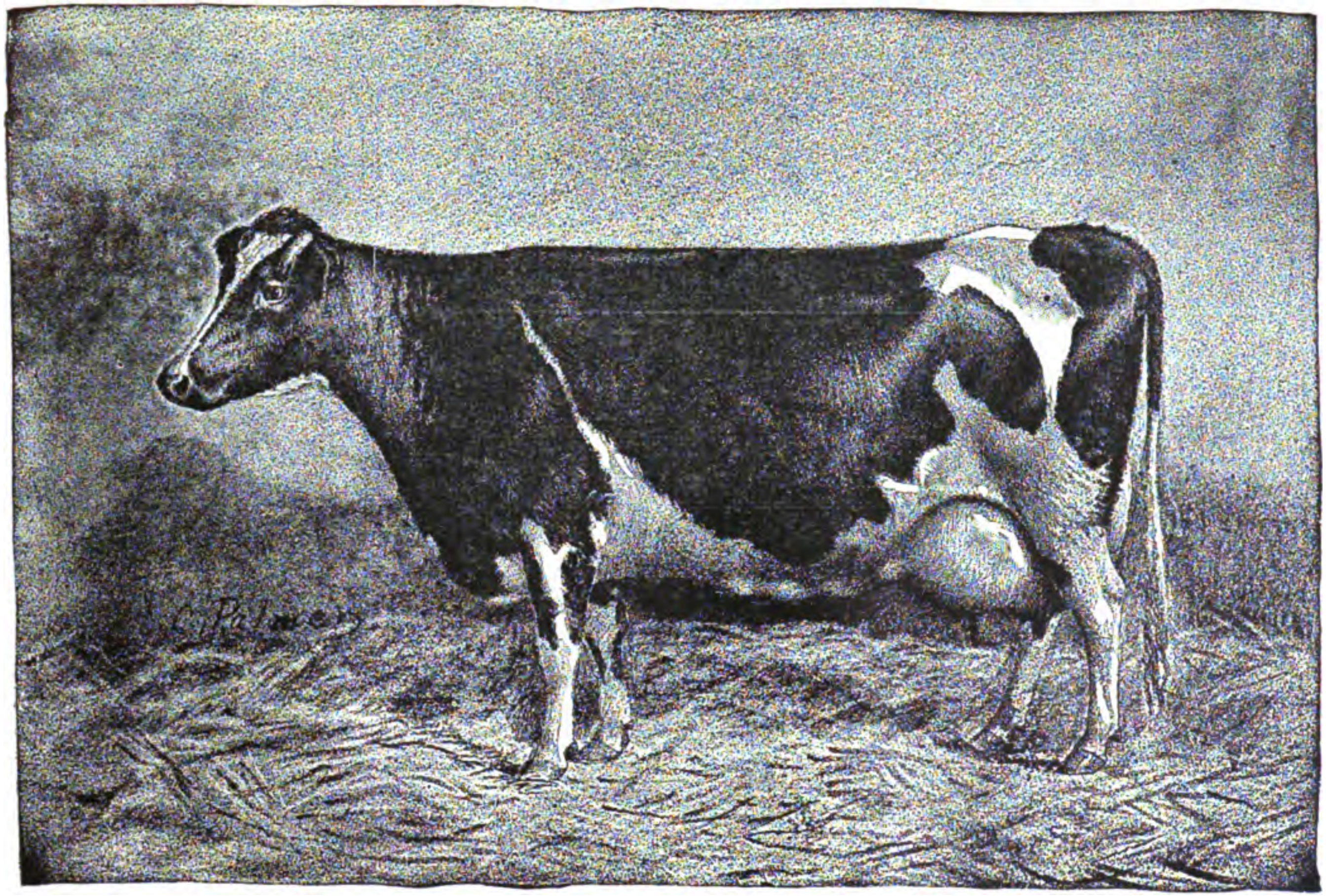
"The practical application of this rule tied the red ribbon on Billy Boelyn's horn, the finest bull of the breed I ever saw. Short-legged, broad, level back, straight on rumps, ribs well sprung and covered with a mellow hide, resting on wonderfully soft tissues. He is modeled more after the Short-Horn than Friesian type. The second premium went to Mooie, a large animal of the true Holstein type, one that has been a successful campaigner. Taken as a whole, this was a fine show of Holstein bulls."

Billy Boelyn has won more prizes and sired more prize bulls, and bulls which stand at the head of leading herds, than any bull living or dead.

HYKOLINA.

No. 746, H. H. B.

Calved March, 1877 (imported.)
Color, black; white stripe in face and over hips.
Winner 1st prize Northern Ohio Fair, 1879.
1st prize Pennsylvania State Fair, 1882.
Sweepstakes Pennsylvania State Fair, 1882.
1st Ohio State Fair, 1883.
2d Tri-State Fair, 1883.
1st Mahoning and Shenango, 1883.
Bred January 27, 1892, to Pietertje King, 13400, H. F. H. B.
Record, 58 lbs. 11,183 lbs. in one year.
Property of Edgar Huidekoper, Meadville, Pa.



HYKOLINA, No. 746, H. H. B.

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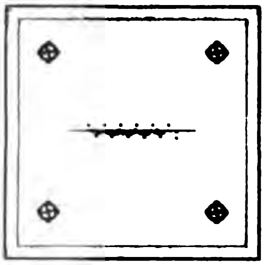

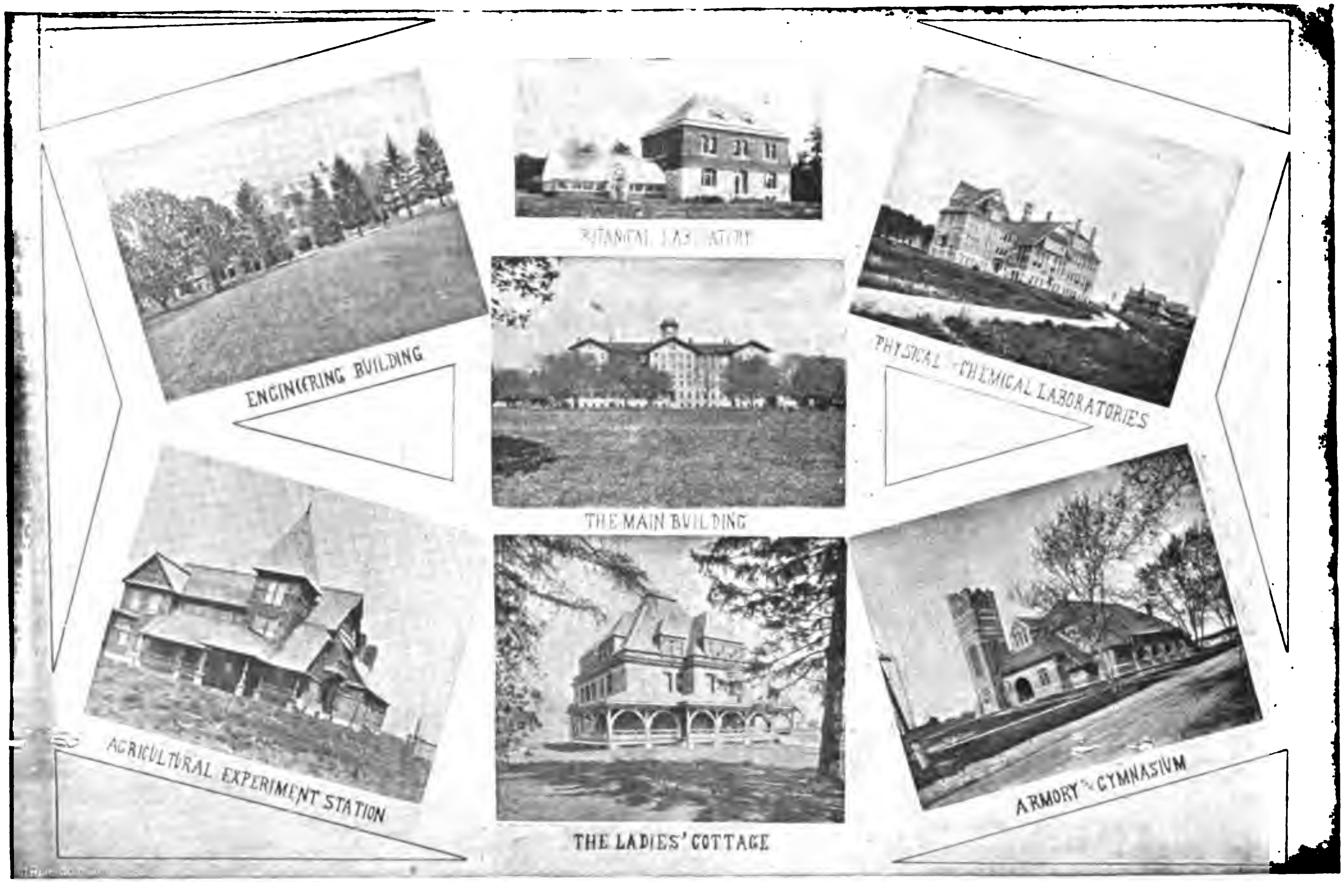

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MILTON S. McDOWELL,	Assistant in Chemical Laboratory.

DESCRIPTION OF THE INSTITUTION.

The College was organized in 1859 as the "Farmers' High School," and its object then was to give an exclusively agricultural education. Its organization, however, was upon a collegiate basis from the beginning, and its name was, in 1862, changed to "The Agricultural College of Pennsylvania." Subsequently, the Legislature of the State having appropriated to it the income from the proceeds of the national land grant, and the field of its work having thus been necessarily enlarged, its name was, in 1874, again changed, and it has since been known as "The Pennsylvania State College."

The scope of the institution, as now organized, cannot be better stated than in the words of the Act of Congress, defining the duty of this and similar colleges:

"The leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislature of the State may prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

This Act of Congress was, in 1863, "accepted by the State of Pennsylvania, with all its provisions and conditions, and the faith of the State * * * pledged to carry the same into effect." (Laws of 1863, p. 214).

Based upon this broadened foundation, the special work of the State College is the training of youth in those branches of learning which lie at the foundation of modern industrial pursuits. In accordance with the purposes of its founders and the terms of its original charter, it aims to give special and prominent attention to agriculture, both theoretical and experimental; but it also provides "a liberal and practical education" in the leading branches of mathematical, natural and physical science, in order to prepare youth for "the several pursuits and professions in life." In other words, while the College is no longer exclusively agricultural, it is doing more in the direction of progressive and scientific agriculture than when that was its principal object; and at the same time, it has increased its subjects and courses of study, and its teaching and illustrative equipment, to such an extent that now "without excluding classical studies," its leading object is to teach the various sciences in such a manner as to show their applications in the more important industries—to combine with every branch of instruction such an amount of actual practice in the Shop, the Field, and the Laboratory as will serve to illustrate and apply the theory, but without subordinating it.

The range of its work in this direction is shown, af far as the limits of space allow, in the following descriptive statements and schedules. It is confidently believed that few institutions in the country furnish opportunity for obtaining an advanced scientific education of equal extent and thoroughness at so moderate a cost and with so many incidental advantages.

LOCATION.—The institution is situated in the village of State College, nearly twelve miles southwest of Bellefonte, and almost in the exact geographical centre of the State. Its position, in the midst of a broad, rolling valley, with Muncy mountain on the north, Tussey mountain on the south, and Nittany on the east, secures a varied and beautiful landscape and a healthful climate.

A special act forbids the sale of intoxicating drinks within two miles of the College, and all its surroundings are exceptionally free from demoralizing influences and from temptations to extravagance.

CAMPUS AND FARM.—The College grounds contain four hundred acres. The tract on which the buildings stand contains nearly three hundred acres. Of this, about fifty acres in the immediate vicinity of the buildings constitute the Campus and furnish recreation grounds, sites for residences, laboratories and other buildings. The Campus, tastefully laid out and adorned with trees, shrubbery, flower gardens, walks and drives, is one of unsurpassed beauty. About forty acres are in natural forest growth, and the remainder is conducted with a view to furnishing an example of a model farm profitably managed. The Professors in charge of instruction in Agriculture and Horticulture make use of all parts of the College grounds for the purpose of practical illustration in their respective departments, one hundred acres being set aside for the exclusive use of the Experiment Station.

BUILDINGS.—The main College building is a plain and substantial structure of magnesian surpassed beauty. About forty acres are in natural forest growth, and the remainder is limestone, standing on a pleasant elevation, and is two hundred and forty feet in length, eighty feet in average breadth, and five stories in height, exclusive of attic and basement. It contains chapel, library, museums, society halls, class rooms and about one hundred dormitories. The building is heated throughout with steam, is lighted by electricity and is furnished on every story with pure water from an artesian well. A large part of the building has recently been thoroughly overhauled and rearranged, adding greatly to the facilities for work and for public gatherings. The sewerage system is well devised and frequently inspected, and the unusual exemption of our students from sickness testifies to the excellent sanitary condition of the building.

Within the last few years the College has greatly enlarged its facilities for instruction by the erection of new buildings, the reconstruction of old ones and the purchase of a large amount of equipment for the leading departments.

The Botanical Department,
The Chemical Department,
The Department of Physics,
The Department of Civil, Electrical, Mechanical and Mining Engineering,
The Ladies' Department,
The Military Department,
The Agricultural Experiment Station,

Have been provided with commodius and attractive buildings, designed and built with special reference to their adaptation to the needs of these several branches of work. The drill hall of the military department has also been fitted up for use as a gymnasium, with the Sargent system of movable apparatus. The building for the accommodation of civil, mechanical and mining engineering was opened with appropriate ceremonies, February 22, 1893, and was ready for occupancy at the opening of the fall session, September, 1893.

This building is three stories high, with a deep and well-lighted basement, and has a frotage of 266 feet and an extreme depth of 208 feet. It has been carefully planned with reference to the needs of the several branches of instruction to which it is devoted, and is amply provided with lecture rooms, laboratories, shops, testing-rooms, room for department libraries, model room, etc., etc., and equipped with the most modern machinery and appliances. The Boiler House and Dynamo Room from which heat, power and light are furnished for all the public buildings, are an integral part of the Engineering building; and their equipment is used as an addition to the apparatus of practical instruction and experimentation in steam and electrical engineering.

The College is thus prepared to carry on its several branches of work more efficiently and successfully than ever before, and every effort is made to provide this large increase of additional facilities without any considerable increase in the expenses of students.

ENDOWMENT.—The principal income of the College is derived from the proceeds of the sale of the public lands donated to the State by the General Government for College purposes. The State holds these proceeds in trust, for which it has given its bond for $500,00, on which it pays interest to the College at the rate of 6 per cent. per annum. An additional sum of $15,000 a year, to be increased $1,000 annually until it amounts to $25,000 a year, is appropriated to the College under the provisions of the Act of Congress, approved August 30, 1890.

TRUSTEES.—The control of the institution is vested in a board of trustees, consisting of twenty-three members. The ex-officio members are nine in number, and include official representation of the interests of the Commonwealth, of agriculture, of the mechanic arts and of general education. Of the other fifteen members one-third are elected annually at the College on the Tuesday following the tenth day of June—one by the Alumni of the College and the other four " by a body of electors composed of the Executive Committee of the Pennsylvania State Agricultural Society, the managers of the Franklin Institute of Pennsylvania, three representatives duly chosen by each county agricultural society in this Commonwealth, which shall have been organized at least three months preceding the time of election, and three representatives duly chosen by each association, not exceeding one, in each county of the Commonwealth, which shall have for its principal object the promotion and encouragement of the mining and manufacturing interests of the Commonwealth, and the mechanic and useful arts, and which shall, in like manner, have been organized at least three months preceding the time of election."

PRACTICAL TRAINING (Practicums).—The College has, from the first, sought to combine practical with theoretical instruction, and thus to fix in the student's mind a knowledge of both methods and principles. With this end in view, a portion of the student's time has been set apart for such training, and the number of subjects in which instruction is given, and the supply of apparatus for it has been increased until it covers an extensive range of topics, as will appear from an examination of the several schedules. A part of this training is largely technical, and is almost wholly confined to certain courses. Other parts, however, are so general in their character as to be appropriately required of all students. Among these practicums common to all, the following may be mentioned for the sake of illustration: Drawing, free-hand and mechanical; Military Drill required by the law of Congress, and helpful in securing right habits of body and mind; Horticulture, giving instruction in all ordinary operations belonging to fruit culture, such as pruning, grafting, budding and propagation by cutting and layers; Mechanic Arts, in which are learned the care and use of tools and the principal processes which lie at the foundation of all mechanical industries, without leading directly to any specific trade; and Sureveying, which acquaints the student with the instruments of the art, and trains him to determine points, distances and areas.

Some of these practicums not only give knowledge of almost universal use, but also serve to develop, during the early part of the course, tastes and aptitudes which may determine the student's choice of a technical course and of his life work.

In the Technical Courses, special lines of practice have a large amount of time given them proportionate to their importance for subsequent professional use. Each practicum is directed by an instructor who is familiar with both the theory and the practice, and with their mutual relations. The instruction is so largely personal that an earnest student may advance far beyond the average attainment required as a minimum. The experience of the College adds, from year to year, to the evidence that this training is highly valuable, and in directions which could not have been foreseen.

Increased teaching force has been provided in the departments of electricity, chemistry, mechanical engineering, zoology, civil engineering, mathematics, the English language, and industrial art and design, and a department of mining engineering has been established upon a broad foundation.

Even these changes have hardly kept pace with the immdiate and urgent needs created by the increased number of students, and further additions to buildings and equipment are still imperatively required.

The aditional aid given to the College by the United States government, during the last four years, places it upon a footing of assured prosperity. By the law approved March 2, 1887, Congress provided for an annual appropriation of $15,000 a year for the sole purpose of maintaining work in agricultural experiments and research, and the work of the agricultural department is therefore well provided for.

By a law, approved August 30, 8190, the sum of $15,000 for the first year, to be increased each year until it reaches $25,000, to be paid out of the proceeds of the public lands, has also been appropriated to the institution in order to increase its facilities for instruction.

This additional apropriation is to be expended exclusively for instruction "in agriculture, the mechanic arts, the English language, and the various branches of mathematics, phycisal, natural and mechanical science, with special reference to their applications in the industries of life and to the facilities for such instruction."

It is this law that has made possible the increase of the teaching force in several departments already established, and will enable the College to provide still more efficiently for the various branches of science as applied to the industrial pursuits of the State.

COURSES OF INSTRUCTION.

The organization of the College is such that the instruction given naturally falls under several departments, which are distinct, and yet so mutually related as to form, when combined in groups, well proportioned, systematic and progressive courses of study. The number of such courses is now ten, viz:

I. General Courses:

1. A General Science Course.
2. A Latin-Scientific Course.

II. Technical Courses:

1. Agriculture.
2. Biology.
3. Chemistry.
4. Civil Engineering.
5. Electrical Engineering.
6. Mathematics.
7. Mechanical Engineering.
8. Mining Engineering.
9. Physics.

Many of the students of the first two years are the same in all the courses—these being intended to serve as a common foundation for both the general and the technical work of the Junior and Senior years, while the technical courses include a considerable amount of studies intended to promote general in distinction from special education. The experience of the College clearly shows that the time thus taken from strictly technical branches is far more than made up to the student by giving him a clearer and wider vision, and a more facile use of all his powers and acquirements.

The students of the first two years furnish a fair degree of eaucation for those who cannot take a full college course, but who desire to fit themselves well as land surveyors, or for any of the ordinary callings of life. Students leaving at this period of their course receive from the faculty a certificate showing the amount of work done.

Space will not allow a description of all the courses, but that in agriculture is given in full. Further information will be found in the catalogue which may be procured on application to the President of the College.

THE COURSE IN AGRICULTURE

Has been thoroughly recast in order to adapt it as far as possible to present requirements in both science and practice. The object of the Course is to give young men a thorough education at the same time that they are carefully instructed in the relations that the sciences bear to the various branches of Agriculture; to give both the mental training that is indispensable to success, and the scientific and technical knowledge requisite for becoming efficient workers in agricultural affairs, whether as practical farmers, teachers or investigators. Any lower aim would fail to meet not only the requirements of the laws under which the College is organized, but the progressive demands of the time. The constant object is to teach how the principal branches of physical and natural science are applied to the business of farming, and to afford a thorough and comprehensive knowledge of its principles and methods; to explain the nature of soils and manures, the reasons for and the best methods of tillage, the constituents and characteristics of plants and animals, and the conditions favorable to their development. Practice is combined with theory whenever the processes involve skilled labor, but the student's time is not consumed in merely manual operations.

As will be seen by an examination of the schedule of studies and practicums of this course, the time is fully occupied with instruction in the class-rooms, laboratories, orchard, vineyard and field, and no pains will be spared to give the earnest student a high degree of intellectual training, and thorough special preparation for the most advanced requirements of a farmer's calling. Increased teaching force and equipment have been provided for this department of instruction, and the opportunities offered to young men were never so complete and satisfactory as at the present time.

The instruction is so arranged as to begin the study of technical subjects in the Freshman year, and to continue them throughout the course. At least one technical study is taught every term of each year. Those technical subjects requiring the least previous preparation are taught in the earlier part of the course, while the student is securing a training in English, Mathematics, Elementary Chemistry and Modern Languages, which are essential to his further studies.

Inasmuch as agriculture involves so large a number of the sciences, the student is given a broad training in those studies. The studies in general science are: Chemistry, three terms; Botany, three terms; Biology and Zoology, three terms; Physics, two terms; and Geology, two terms.

History, Political Economy, Constitutional and International Law are taught as a preparation for the duties of citizenship. No class of citizens have greater need than farmers of a clear understanding of public questions as they affect themselves and the public interest.

What may be considered the technical or special studies of the course are arranged in the following order:

RURAL LAW AND FARM ACCOUNTS.—A study of the laws which most directly concern farming; principles and forms of farm accounting.

CARPENTRY.—Instruction and practice in the use and care of tools, including shaping to dimension and joinery.

AGRICULTURAL CHEMISTRY.—Taught by lecture, with references to Johnson's "How Crops Feed" and "How Crops Grow."

Plants.—How they grow; the chemical elements indispensable to their growth and the compounds from which plants can take them up; how plants feed; the compounds formed in the plants; variations in plant composition due to differences in species, variety, stage of maturity, climate and supply of plant food; germination; fermentation.

Chemistry of soil and water.—Mineral basis of the soil; composition of rocks; changes due to weathering; translocation and deposition of soils; classification of soils; mechanical analysis; formation of organic matter in the soil; its composition, the changes it undergoes, and its uses; nitrification; power of soil to fix chemical compounds introduced; its relation to losses in drainage; the air and water of the soil; composition of river and mineral waters as compared with rain water; soil heat in its relation to soil chemistry.

Improvement in the soil.—Chemical effects of tillage, drainage, irrigation, addition of sand, burning and fallowing.

Fertilizers.—Indirect fertilizers—Effects of lime and other compounds of the earthy bases.

Direct fertilizers—Phosphates, potash salts, nitrogenous compounds:—their sources, manufacture and use. Green manures; stable manure and its preservation; sewerage and factory waste; composting.

Maintenance of fertility. Fertilizer theories; relation to systems of agriculture.

Practicums.—Include lectures and laboratory practice on the methods of quantitative analysis applied to fertilizers, rocks, soils, foods, milk, etc.

FARM APPLIANCES AND BUILDINGS.—Kinds and adaptation of farm implements and machinery; application of different kinds of power to farm purposes; plans and essential features of farm buildings; fences, roads and water supply.

SOILS.—Kinds; physical properties; cultivation, drainage and irrigation.

Cultivation.—Reasons, methods and appliances.

Drainage.—Practical details of farm and road drainage; leveling and locating drains, material, size, shape, depth, grade and number; effect of drainage; cost and profit; machines and appliances.

Irrigation.—General features; adapted to localities; methods; surface or sub-irrigation.

METEOROLOGY.—Davis' Meteorology, supplemented by lectures.

STOCK FEEDING.—

Animal chemistry.—General composition of animal body; chemistry of digestion and absorption; the blood; body wastes; functions of the various nutrients in the formation of tissue and the production of heat and work.

Feeding stuffs.—Composition and digestibility as affected by soil, manure, rate of seeding, etc. etc. Sources, composition and uses of bye fodders. Preservation and preparation of fodders—hay-making, ensilage, steaming and cooking feed.

Feeding for special purposes.—Nutrients, fodder and rations. Feeding standards, calculation of rations. Fuel value of fodders and rations. Maintenance rations. Excess food.

Feeding working animals.—Influence of work on metabolism. Source of muscular power.

Feeding for meat production.—Beef, mutton and pork. Differences in nutrition of young and mature animals. Growth and fattening. Influence of food on carcass.

Feeding for milk.—Nature and composition of milk; formation of milk in the udder; influence of food on yield and composition of milk; effects of breed; individuality, period of lactation, etc.; effect of feed on quality of dairy products.

ANIMAL HUSBANDRY.—Principles of stock breeding—heredity, atavism, variation, laws of correlation, terms used—thoroughbred, in-breeding, pedigree, parental, mental, climatic influences; controlling sex; selection; period of gestation. Care and management of live stock; handling and training.

History, characteristics and purposes of breeds of live stock. A few of the leading types of live stock are kept on the farm, which give the students opportunity for judging and scoring and for studying the essential points of breeds adapted to different purposes. Some of the finest specimens of many of the breeds are illustrated by lithographs, photographs and lantern slides. By means of herd books and other historical literature on such subjects, the methods of producing these specimens are studied. Students wishing to make a specialty of any particular breed or breeds will be afforded facilities and directed in the way of doing so.

DAIRY HUSBANDRY.—Statistics of products and consumption; adaption to certain sections; winter or summer dairying, dairy or creamery; characteristics, testing and selling of milk; butter and cheese making; effect of foods on products; breeds of dairy cattle, their rearing, management and replenishment.

HORTICULTURE.—Instruction in Horticulture is given largely by the practical operations of the garden and orchard, such as pruning, grafting, budding and making cuttings and layers.

Fruits.—Methods of propagation; preparation of ground; cultivation and after treatment. Storage and marketing; hybridization and origination of new varieties; diseases and their remedies.

Vegetables are considered in the same general way. The history and peculiarities of individual varieties are studied and also the best methods employed in their cultivation.

Ornamental plants: their nature and use in landscape gardening.

The aim is to cover all parts of the subject of Horticulture, and in the green-houses, gardens, orchards and grounds of the College students have a most excellent opportunity for seeing a great variety of both the useful and ornamental plants under cultivation and experiment.

COMPARATIVE ANATOMY is taught in connection with the study of Biology and Zoology.

ECONOMIC ENTOMOLOGY is taught in connection with the study of Zoology. The structure and life history of insects are fully studied, after which special study is made of the principal beneficial and injurious species.

VETERINARY SCIENCE.—Preventive measures, common accidents, principal diseases among farm animals.

FARM CROPS.—The history, production, uses, chief characteristics and essential elements of successful culture of each of the principal farm crops. For example, the subject of Indian corn is treated under the following heads: History, production, use, structure, cross-fertilization, chemical composition, climate, soil, varieties, vitality, culture, harvesting.

RURAL ECONOMY.—Farm management and plans; kinds of farming, as general, special, intensive, extensive, stock dairy and grain, and the essential elements of success in each; farming as a business; marketing; relation of farming to other industries; the farmer as a producer, manufacturer, merchant, transporter and consumer.

HISTORY OF AGRICULTURE in those countries from which we derive our agricultural practices and products; American agriculture; present agricultural methods in foreign countries.

FORESTRY, including not only a study of various forest trees, and their uses, but also the production and conservation of forests and forest conditions. Instruction will be chiefly by lectures, and the subject will be made as practical as possible.

SHORT COURSE IN AGRICULTURE.

A set of lectures on technical agricultural subjects will be given during the winter term. The lectures for the winter of 1894 begin Wednesday, January 3, and continue twelve weeks.

While all applicants over fifteen years of age will be admitted without examination, the better the previous preparation the greater will be the benefit obtained by those attending the lectures.

These lectures are designed for those whose time for the study of this subject is limited to one or two winters. It is the aim to give as large an amount of thoroughly useful information about farming and gardening and the principles underlying the art, as time will show.

The lectures will be divided into four general heads, viz.: Agricultural Science; Horticulture and Economic Entomology; Veterinary Science. These lectures will be given by men who have had special training in the several lines of which they treat.

LECTURES.

1. Agriculture—60 lectures treating of

Farm management.
Drainage,
Road making,
Breeds, breeding and management of live stock,
Dairying,
Cultivation of farm crops.

The practicums in this line will consist of practice in the measurement, planning and mapping of farms and farm buildings leveling for drains and roads; practice in judging live stock, practice in handling milk and making butter by various approved methods; taking notes upon the feeding and management of live stock on the Experimental and College farms, as well as taking notes upon the various operations of each.

2. Agricultural Science—60 lectures treating of

elementary notions of chemistry and physics; chemical elements of agricultural importance and some of their compounds. Chemistry of air and water.

Soils.—How they are formed; their chemical and physical differences.

Plants.—How they grow; the technical elements indispensable to their growth and the compounds from which plants can take them up; how plants feed; the compounds formed in the plants; varieties in plant composition due to differences in species, variety, stage of maturity, climate and supply of plant food; germination, fermentation.

Animals.—General composition of animal body; chemistry of digestion and absorption; the blood; body waste; functions of the various nutrients in formation of tissues and production of heat and work.

Feeding stuffs.—Composition and digestibility as affected by soil, manure, rate of seeding, etc., etc. Sources, composition and uses of bye fodders. Preservation and preparation of fodders, hay-making, ensilage, steaming and cooking feed.

Feeding standards and calculations of rations. Growth and fattening; feeding for meat, milk, wool, etc.

Milk.—Its nature and composition, variation in composition as affected by food, breed and individuality. Effects of feed on quality of dairy products.

Practicum.—Milk testing, one hour per week.

3. Horticultural and Economic Entomology—60 lectures treating of

the ordinary vegetables and fruits. Their treatment and cultivation, together with their insect enemies and the best methods of destroying the injurious kinds. Green-houses and other facilities make it possible to give a practical course on these subjects even in the winter season.

4. Veterinary Science—24 lectures treating of

common diseases and accidents, with Clinics once a week.

Students may select between practicum in Agriculture and Horticulture according to their individual needs and desires, and thus emphasize that line of work to which they wish to give the most attention.

This course is not intended in any sense to take the place of the regular four years' course, but to supplement it. It is hoped that this short course will meet the wants and needs of a large body of earnest, bright young men in the Commonwealth of Pennsylvania who wish a fuller knowledge of modern farm methods. It should in no case be taken as a substitute for the more thorough, and hence in the end, more practical four years' course. Every young man who has the time and means should take the more extended course. The largest measure of success involves such a wide range of knowledge that the most thorough technical training is required.

No charge will be made at present to persons attending these lectures, except the fee of five dollars to cover incidentals, and the small laboratory fee in special cases. Rooms in the College dormitories cannot be guaranteed, but will be provided at the usual rate as far as possible. Those who desire to attend should make application as long in advance as possible.

AGRICULTURAL EXPERIMENT STATION.

The Agricultural Experiment Station, as a distinct branch or department of the College, was organized by the Trustees in 1887, in acordance with the provisions of the Act of Congress, generally known as the Hatch Act. The College had for several years carried on extensive lines of research and experiment, and these are being continued and greatly enlarged under the new organization.

The funds specifically devoted to the work of the Station are expended in making such experiments and investigations as seem best adapted to render practical and efficient aid to the farmers of the State in the pursuit of their calling. Various experiments of this sort have been completed and numerous others are now in progress. The results are published quarterly in the form of bulletins, and the year's work is summed up in an annual report. Both reports and bulletins are printed for gratuitous distribution, and will be mailed regularly, free of charge, to any citizen of the State applying to the Director, Dr. H. P. Armsby.

The Station also invites correspondence and suggestions from farmers and others interested in its work, and inquiries upon matters pertaining to agriculture or horticulture will be cheerfully answered by the Director, as far as possible.

All communications to this department should be addressed "Agricultural Experiment Station, State College, Pa."

MECHANIC ARTS.

This course has been in full operation since September, 1884. The course is designed to afford such students as have an ordinary common school education an opportunity to continue the elementary scientific and literary studies, together with mechanical and free-hand drawing, while receiving theoretical and practical instruction in the various mechanical arts.

The instruction in shop work is given by means of exercises so planned as to include, in a systematic manner, the operations in use in the various trades, but, the object being to give instruction in the use of tools, only such constructions are made as cover principles, without undue repetition.

The first instruction in carpentering and joining is the use of the saw and plane in working wood to given dimensions, and a series of elementary exercises follows in order, such as practice in making square joints, different kinds of dove-tails, the various tenons, roof-trusses, panels, etc.

The instruction in turning and circular-section pattern-making also is given from a series of exercises.

In the forge-shop are taught the management of the fire and the degrees of heat necessary to forge different metals. Drawing, forming, bending, upsetting, fagoting, splitting, punching, chamfering, annealing, tempering, case-hardening, etc., are taught by means of a series of exercises in which the elements of the iron forger's art are particularly dwelt upon. Every piece is made to certain dimensions laid down upon the drawing, the article being forged before the class by the instructor who directs attention to the essential feature of the operation, which is then repeated by each student.

The course in vice work includes filing to line, filing to template, free-hand filing, fitting and chipping straight and grooved surfaces in cast iron, wrought iron and steel.

In the machine shop, the student, after having the lathe and its mechanical construction explained to him, is taught centering, tape-turning,chucking, reaming, inside and outside screw-cutting, bolt-turning, etc. He is then required to construct some pieces of mechanism in which many of these principles are involved

The drawing of this course extends through the entire three years.

This work is looked upon as of the highest importance, and the effort is to make the instruction thorough, practical and of direct utility. Considerable time is devoted to free-hand drawing, and it is believed that it not only assists in mechanical drawing but it is of great service in after years, whatever the occupation chosen.

The mechanical drawing consists of a series of exercises, and such are selected as will be of subsequent use. They are arranged in progressive order, beginning with geometrical constructions involving straight lines and circular arcs only, and ending with more complex curves, such as the ellipse, helix, epicyloid, etc.

Projection is next taken up. The instruction in this is from models, so that the student may have before him the actual object from which the projection is made, and not be obliged to depend upon his unaided conception. After completing this work he is required to draw parts of the machines from actual measurements. For this purpose he is given some piece of mechanism to sketch and measure, of which, finally, he is to make complete working drawings.

The mathematical instruction of the course covers Algebra, Plain and Solid Geometry, Plane and Spherical Trigonometry and Land Surveying, taught with special reference to this class of students, many practical applications being made. The department is already well equipped, but additions of machinery are being made, from time to time, to meet the requirements of the course.

GENERAL STATEMENTS.

1. DEGREES.

The Degree of Bachelor of Science in conferred upon graduates of the four years' Courses. The diploma given to graduates of the Technical Courses contains mention, also, of the special line of technical work pursued.

The Degree of Master of Arts or Master of Science is conferred upon graduates of the State College, of at least three years' standing, who are known to have been systematically pursuing scientific, literary, or professional studies, and upon graduates of this or other institutions who have, satisfactorily to the Faculty, studied at least one year in the Graduate Courses.

2. GRADUATE INSTRUCTION.

Persons who have been graduated in one of the Regular Courses here, or an equivalent course elsewhere, are permitted to enter the College for instruction in an advanced course, consisting of such studies as may, in each case, be approved by the Faculty.

3. LIBRARIES AND READING-ROOMS.

The Library belonging to the College has over eight thousand volumes, embracing scientific and technical works, memoirs, scientific essays, agricultural and educational works, etc., in English, French and German, forming the foundation of a good Scientific Library. Four or five hundred volumes per year are being added.

The Reading-room, in connection with the College Library, offers to Faculty and Students an ample and well-selected list of scientific and other periodicals. The Engineering Departments are provided with a sepcial reading room and library supplied with the best technical works and magazines.

Each of the two Students' Literary Societies has a good Library of standard and miscellaneous works, and a reading-room supplied with some of the principal literary periodicals and newspapers of the day.

4. FREE (SENATORIAL) SCHOLARSHIPS.

The Trustees have established fifty scholarships, one for each Senatorial district in the State, entitling the holder to exemption from all College charges (except for lights and for material used in the Laboratories), in any of the REGULAR FOUR YEARS' COLLEGE

COURSES. The scholar, male or female, is to be appointed by the Senator of the district, after a competitive examination in the studies required for admission to the Freshman class (General Science Course), or to the third year of the Course in Mechanic Arts. No person is eligible as a candidate who has previously been admitted to any College class.

The holder of the scholarship is admitted to any of the REGULAR COLLEGE COURSES (but not to the Preparatory or Special courses) free of the ordinary charges for incidentals, room rent, fuel and furniture. This allowance amounts, at the present rate of charges, to fifty dollars a year, and is continued the entire College course, provided that both conduct and class standing be satisfactory to the Faculty. A vacancy may be filled after the opening of the college year, if the appointee's attainments do not fall below the standard of the class at the time of the application for admission. For information as to vacancies, time and place of examination, etc., candidates for scholarships should apply to their Senator (in whose hands the details of appointment have been placed by the Colleg) or to the President of the College.

5. EXPENSES.

No charge whatever is made for Tuition, except for special instruction in music.

INCIDENTALS.—Each student, whether from a distance or resident in the neighborhood, is required to pay $17.00 a year for the heating, lighting, and care of the recitation and other public rooms, viz: $7 for the Fall session, $5 for the Winter, and $5 for the Spring. This is the only charge (except a small laboratory fee in some of the courses) made to students who do not occupy college rooms.

ROOM RENT.—Preparatory students are required to occupy rooms in the college dormitories but college students may occupy rooms elsewhere, subject in all cases to the approval of the Faculty. To those who rent rooms in the college dormitories, the uniform charge is as follows:

		Fall Session.	Winter Session.	Spring Session.
1. Students not renting a College room,	Incidentals,	$7 00	$5 00	$5 00
2. Students renting a College room—(*Rooming alone*),	Incidentals,	$7 00	$5 00	$5 00
	Room rent,	15 00	18 00	12 00
	Light,	3 50	3 50	2 50
	Key deposit,	50	50	50
		$26 00	$27 00	$20 00
3. Students renting a College room—(*With room-mate*),	Incidentals,	$7 00	$5 00	$5 00
	Room rent,	11 00	14 00	8 00
	Light,	1 75	1 75	1 25
	Key deposit,	50	50	50
		$20 25	$21 25	$14 75
4. Senatorial Students—(*Rooming alone*),	Room rent,	$4 00	$4 00	$4 00
	Light,	3 50	3 50	2 50
	Key deposit,	50	50	50
		$8 00	$8 00	$7 00
5. Senatorial Students—(*With room-mate*),	Light,	$1 75	$1 75	$1 25
	Key deposit,	50	50	50
		$2 25	$2 25	$1 75

By a resolution of the Board of Trustees, each student, before he is permitted to enter his name upon the College roll, is required to pay an amount sufficient to cover all his College bills for the current session, besides a special deposit of $5 as a security against general damages, or, in case he cannot pay immediately, to give a note with sufficient security, for the payment at some future time, unless excused by the Executive Committee.

LABORATORY EXPENSES.—Students during the time they are engaged in laboratories, pay a small charge for their outfit; also, for apparatus destroyed and material consumed by them. Such charges, at present, are as follows:

Botany, per term,	$1 00
Zoology, per term,	2 00
Carpentry, per course,	2 50
Wood-work, per course,	2 50
Forging, per course,	3 50
Chipping and filing, per course,	3 00
Machine work in iron,	4 00
Chemistry, per term,	10 00
Physics, per term,	1 00
Physics and Electrical Engineering, per term,	2 00

In the chemistry practicum, accounts are kept with individual students, who are liable for any excess above the amount paid in advance

BOARD.—The College does not maintain a boarding hall and most students depend upon the boarding-houses, in the vicinity, the regular charge being $3 per week. The College provides facilities for Boarding Clubs which supply their members with good board at from $2.50 to $3.00, according to the varying wishes of the club. The College year is thirty-six weeks.

FURNITURE.—The furniture provided for students who room in the College dormitories consists of a bedstead, mattress, table, washstand and chair. The student provides all other articles, including pillow, bedding, washbowl, pitcher, mirror, etc In the Ladies' Cottage everything is provided except bed clothing and towels.

Uniform.—Each cadet is required to provide himself a uniform, the coat and cap of dark blue cloth, the pantaloons of lighter blue. The entire suit is exceedingly neat and serviceable, and may be worn on any occasion. Measures are taken at the College, and orders filled by some approved maker. The uniform of cadets costs, at present, $14.65, $18.55 or $21.05, according to the quality selected; and must be paid for when ordered.

Music.—Instruction in vocal music or on the piano or cabinet organ will be given at the rate of $10 for twenty lessons, and $3 per quarter (two hours daily) for use of instrument in practicing. Instruction in Harmony, $5 for twenty lessons.

The charge to pupils not in regular standing in the College is a matter of private arrangement with the Instructor. The present charge in such cases is $15 for twenty lessons.

WASHING is at the rate of fifty cents per dozen.

BOOKS AND STATIONERY can be procured at stores and at the College, at regular retail prices.

DAMAGES.—Persons causing special damages will be required to pay for the same. General damages will be assessed upon the body of students.

All remittances should be made to the President, State College, Centre County, Pa., by draft or by money order drawn on State College post office.

ADMISSION TO COLLEGE.

Examinations for admission are held on Thursday of Commencement week, and on the day before the opening of the Fall session, the dates being for 1895, the 13th of June and the 10th of September, respectively. It is desirable, on every account, that candidates be present on one or both of these days. Those who cannot do so will be examined at any time during the year, and admitted to the class for which they are found prepared.

In all cases, the applicant for admission must present evidences of good character, and, when coming from another institution, of honorable dismissal.

For admission to the Freshman class, candidates (of either sex) must be at least fifteen years of age, and pass a satisfactory examination in the following subjects:

1. FOR THE COURSES IN GENERAL SCIENCE, AGRICULTURE, BIOLOGY, CIVIL, ELECTRICAL, MECHANICAL, MINING, ENGINEERING, AND PHYSICS:

English Grammar; Arithmetic; Geography, both Descriptive and Physical; United States History; Physiology; Higher Algebra, through Quadratics and Progressions; Wentworth's Plane Geometry, all; and the elements of Physics, as much as is contained in Avery, Rolfe and Gillet, or Gage.

2. FOR THE LATIN-SCIENTIFIC COURSE: The same as above, with the addition of four books of Caesar and four orations of Cicero.

3. FOR THE SPECIAL COURSE IN CHEMISTRY: Applicants will be admitted without examination, except in Mathematics.

In that branch, at present, the applicant must be fully prepared to pass examination in Arithmetic, including the Metric system, and the first two hundred pages of Newcomb's Elementary Algebra, or an eqivalent; but in order to derive the greatest advantage from the course, it is recommended that students be so far adanced as to have completed the Mathematical Studies of the Freshman year.

4. FOR THE COURSE IN MECHANIC ARTS: The same as for admission to the Preparatory Department: Arithmetic, English Grammar, Physiology, United States History, Political Geography and Algebra to equations of second degree.

5. FOR ELECTIVE COURSES, applicants must at least be prepared to enter the Freshman class, General Science Course.

IN LIEU OF EXAMINATION.

1. GRADUATES OF STATE NORMAL SCHOOLS and of a SELECT LIST OF HIGH SCHOOLS AND ACADEMIES in Pensylvania, whose standard of requirements has been ascertained to be satisfactory, will be admitted to the Freshman class without further examination in studies which, as shown by their diploma or certificate, they have successfully completed in such institution. Such certificate must show specifically the amount of work done and the text book used in each subject.

2. THE HOLDERS OF SENATORIAL SCHOLARSHIPS are admitted provisionally on the certificate of the Examining Committees in the several Senatorial districts.

ADVANCED STANDING.

APPLICANT FOR ADVANCED STANDING, in any course, must pass a further examination in the studies which have been pursued by the class for which they are candidates.

THE FULL COURSES OF INSTRUCTION occupy four years, with three terms, or sessions, in each year. The following Schedules of Studies indicate the amount of work required in the several Courses, or hte equivalent, which will be accepted from candidates for advanced standing. A detailed schedule of the course in agriculture is omitted, the work having been fully outlined on a preceding page.

Specimens of Examination Papers will be furnished on application.

1. GENERAL SCIENCE COURSE.

[Figures after subjects indicate hours of recitation or pratice per week; Italics, title of Text Books.]

Freshman Year.

FALL SESSION.

MATHEMATICS.—Wentworth's College Algebra (4). Solid Geometry, Wentworth or Chauvenet (3).

LANGUAGE.—French or German, Whitney's Grammar, Part I, Super's Reader; Otis' Elementary, Part, Bucheim's Modern German Reader., Part I (4); English, Genung's Hand-Book of Rhetorical Analysis (4).

Practicums (10).—Freehand Drawing (2), Geometric Drawing (4), English (4).

WINTER SESSION.

MATHEMATICS.—Trigonometry, Wheeler (5).

LANGUAGE.—French or German, Whitney's Grammar, Part I, completed, Historiettes Modernes (Fontains; Otis' Elementary Part II, Storm's Immensee, Stifter's Haidedorf, (5); English, Genung's Practical Rhetoric (4).

MILITARY TATICS.—U. S. Infantry Drill Regulations (1).

Practicums (10).—Projection Drawing (4), Carpentry (6).

SPRING SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (5).

LANGUAGE.—French or German, Sept Grandes Auteurs au XIXme Siercle (Fortier); Novelletten Bibliothek (Bernard) (4); English, Morris' Specimens of Early English, Part I (3).

HISTORY.—Fisher's Outlines—Ancient (3).

Practicums (10).—English (4), Horticulture (2), Drawing (4).

Sophomore Year.

FALL SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (4).

SURVEYING.—Bellows' and Hodgman's Manual (1).

LANGUAGE.—French or German, Luquien's French Prose of Popular Science; Hodges' Scientific German (2).

CHEMISTRY.—Lectures on the Non-Metals and Harris' Lecture Notes on General Chemistry (5).

HISTORY.—Fisher's Outlines—Mediaeval (3).

Practicums (10).—Surveying (4), Chemistry (4), Bibliography (2).

WINTER SESSION.

MATHEMATICS.—Calculus, Taylor (3).

LANGUAGE.—French or German, Super's Historical Readings; Gore's German Science Reader (2).

CHEMISTRY.—Lectures on the Metals and Harris' Manual of Qualitative Analysis (3).

BIOLOGY.—Lectures on General Biology (3).

HISTORY.—Fisher's Outlines—Modern (4).

Practicums (10).—Chemistry (8), Biology (2).

SPRING SESSION.

MATHEMATICS.—Calculus, Taylor (4).

LANGUAGE.—French or German, Chateaubriand's Ataia, Rene and Le Dernier Abeucerage; Keller's Dietegen and Freytag's Soll und Haben (4).

CHEMISTRY.—Same as Winter Session (3).

BIOLOGY.—Lectures on General Biology (4).

Practicums (10).—Chemistry (6), General Biology (4).

Junior Year.

FALL SESSION.

LANGUAGE.—French or German, On the basis of Fortier's Sept Grands Auteurs, etc., will be read: Lamartine, Graziella; Victor Hugo, La Chute and Le Guet-Apens (Les Miserables); De Vigny, Cinq Mars; De Musset, Pierre et Camille; Gauthier, Voyage en Espagne; Merimee, Columba; Coppee, Selections (ed. Jenkins); Goethe's Meisterwerke (Bernhardt), with copious extracts from other masterpieces in prose and poetry, and Schiller's Ballads (ed. Johnson) (4).
PHYSICS.—Mechanics, Lodge; Electricity, Poyser (4).
BOTANY.—Bastin's College Botany (4).
PSYCHOLOGY.—James (3).
Practicums (10).—Physical Measurements (4), Botany (6).

WINTER SESSION.

LANGUAGE.—French or German, Guizot's Histoire de la Civilisation en Europe; Freytag's Aus dem Mittelaltev (3).
PHYSICS.—Sound, Stone; Light Lectures and Deschanel (4).
BOTANY.—Bastin's College Botany and Lectures (4).
LOGIC.—Jevons (4).
Praticums (10).—Physical Laboratory (4), Botany (6).

SPRING SESSION.

PHYSICS.—Heat, Garnett (4).
ZOOLOGY.—Lectures (4).
ETHICS.—Bowne (5).
LANGUAGE.—French or German, Hugo's Ernani with Lectures on the Romantic Movement; Sybel's Die Erhebung Europas gegen Napoleon I (2).
Practicums (10).—Physical Laboratory (4), Mineralogy (6).

Senior Year.

FALL SESSION.

ZOOLOGY.—Entomology, Lectures (4).
GEOLOGY.—Dana (4).
ECONOMICS.—Walker's Political Economy (4).
PHILOSOPHY.—Schwegler's A History of Philosophy (3).
Practicums (10).—Zoology (4), Geology (6).

WINTER SESSION.

ASTRONOMY.—Young's General (3).
GEOLOGY.—Dana (3), or ZOOLOGY, Vertebrate, Lectures (3).
CONSTITUTIONAL LAW.—Cooley's General Principles (4).
HISTORY.—Guizot's History of Civilization (4).
Practicums (12).—Geology (4), or Zoology (4), Physiological Psychology (8).

SPRING SESSION.

ASTRONOMY.—Young General (3).
INTERNATIONAL LAW.—Woolsey (5).
LITERATURE.—Taine's History of English Literature (5), or METEOROLOGY (2), and FORESTRY Lectures (3).
HISTORY OF EDUCATION.—Painter (2).
Practicums (10).—Original Work—elective (5), Graduation Thesis (5).

COURSE IN AGRICULTURE.

Freshman Year.

FALL SESSION.

MATHEMATICS.—Solid Geometry, Wentworth or Chauvenet (3).
LANGUAGE.—English, Genung's Hand-Book of Rhetorical Analysis (4).
CHEMISTRY.—Lectures on the Non-Metals and Harris' Lecture Notes on General Chemistry (5).
AGRICULTURE.—Rural Economy, Lectures (3).
Practicums (12).—Agriculture (6), Drawing, Geometrical and Projection (4), Chemistry (2).

WINTER SESSION.

MATHEMATICS.—Trigonometry, Wheeler (5).
LANGUAGE.—English, Genung's Practical Rhetoric (4).
CHEMISTRY.—Lectures on the Metals and Harris' Manual of Qualitative Analysis (3).
AGRICULTURE.—Rural Law, Haigh's Manual of Farm Law (2).
MILITARY TACTICS.—U. S. Infantry Drill Regulations (1).
Practicums (12).—Agriculture (4), Chemistry (8).

SPRING SESSION.

LANGUAGE.—Old English, Morris' Specimens of Early English, Part I (3).
CHEMISTRY.—Same as Winter Session (3).
HISTORY.—Fisher's Outlines—Ancient (3).
AGRICULTURE.—Farm Appliances and Buildings, Lectures and Thomas' Farm Implements (3).
AGRICULTURAL CHEMISTRY.—Lectures and Johnson's How Crops Grow (4).
Practicums (10).—Agriculture (2), Agricultural Chemistry (2), Chemistry (6).

Sophomore Year.

FALL SESSION.

LANGUAGE.—German, Otis' Elementary, Part I, Buckheim's Modern German Reader (4).
MATHEMATICS.—Surveying, Johnson (1).
HISTORY.—Fisher's Outlines—Mediaeval (3).
AGRICULTURAL CHEMISTRY.—Lectures (5).
Practicums (14).—Agricultural Chemistry (10), Surveying (4).

WINTER SESSION.

LANGUAGE.—German Otis' Elementary, Part II; Storm's Immensee; Stifter's Haidedorf (5).
HISTORY.—Fisher's Outlines—Modern (4).
GENERAL BIOLOGY.—Lecture (3).
AGRICULTURAL CHEMISTRY.—Lectures (3).
Practicums (12).—Agricultural Chemistry (4), Biology (2), Mechanic Arts (6).

SPRING SESSION.

LANGUAGE.—German, Novelletten Bibliothek (Bernhardt) (4).
BIOLOGY.—General, Lectures (4).
AGRICULTURE.—Stock Feeding, Lectures and Armsby's Cattle Feeding (5).
Practicums (14).—Biology (4), Agriculture (6), Stock Feeding (4).

Junior Year.

FALL SESSION.

PHYSICS.—Mechanics, Lodge; Electricity, Poyser (4).
BOTANY.—Bastin's College Botany (4).
AGRICULTURE.—Soils, Lectures and Elliott's Practical Farm Drainage (2); Animal Husbandry, Saunders' Horse Breeding and Curtis' Horses, Cattle, Sheep and Swine (5).
Practicums (10).—Botany (6), Soils (4).

WINTER SESSION.

PHYSICS.—Sound, Stone; and Light, Lectures and Deschanel (4).
BOTANY.—Cryptogamic, Lectures (4), Economic, Lectures (2).
AGRICULTURE.—Dairy Husbandry, Lectures and Stewart's Dairyman's Manual (5).
Practicums (12).—Cryptogamic Botany (6), Dairying (6).

SPRING SESSION.

PHYSICS.—Heat, Garnett (4).
AGRICULTURE.—Horticulture, Lectures (5). Meteorology, Lectures (2), Forestry, Lectures (3).
Practicums (14).—Horticulture (10), Meteorology (4).

Senior Year.

FALL SESSION.

ECONOMICS.—Walker's Political Economy (4).
AGRICULTURE.—Horticulture, Lectures (2); Lectures on Entomology and Comparative Anatomy (4).
GEOLOGY.—Dana (4).
Practicums (12).—Entomology (4), Horticulture (8).

WINTER SESSION.

POLITICAL SCIENCE.—Cooley's General Principles of Constitutional Law (4).
GEOLOGY.—Dana (2).
AGRICULTURE.—Lectures on Farm Crops (5); Lectures on Agricultural Chemistry, Horticulture or Veterinary Science (4).
Practicums (10).—Agricultural Elective and Thesis.

SPRING SESSION.

POLITICAL SCIENCE.—Woolsey's International Law (5).
AGRICULTURE.—Lectures on Agricultural Chemistry, Horticulture or Veterinary Science (5); Lectures on History of Agriculture (3); Lectures on Highway Engineering (2).
Practicums (10.—Agricultural Elective and Thesis.

COURSE IN BIOLOGY.

Freshman Year.

FALL SESSION.

MATHEMATICS.—Wentworth's College Algebra (4), Geometry, Wentworth or Chauvenet (3).
LANGUAGE.—French or German, English or Latin—Whitney's Grammar, Part I; Super's Reader; Otis' Elementary, Part I; Buchheim's Modern German Reader, Part I (4); Genung's Hand-Book of Rhetorical Analysis; Sallust's Catiline, Allen and Greenough (4).
Practicums (10).—Free-Hand Drawing (6), English (4).

WINTER SESSION.

MATHEMATICS.—Trignometry, Wheeler (5).
LANGUAGE.—French or German, English or Latin—Whitney's Grammar, Part I, completed; Historiettes Modernes (Fortaine); Otis' Elementary, Part II; Storm's Immensee; Stifter's Haidedorf (5); Genung's Practical Rhetoric (4); Livy—Early Roman History or Hannibalic Wars (5).
MILITARY TACTICS.—U. S. Infantry Drill Regulations (1).
Practicums (10).—Free-Hand Drawing (4), Carpentry (6).

SPRING SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (5).
LANGUAGE.—French or German, English or Latin, Sept Grands Auteurs du XIXme Siecle (Fortier); Novelletten Bibliothek (Bernhardt) (5); Moris Specimens of Early English, Part I (3); Tacitus—Germania and Agricola (3).
HISTORY.—Fisher's Outlines—Ancient (3).
Practicums (10).—Free-Hand Drawing (4), English (4), Plant Study (2).

Sophomore Year.

FALL SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (4).
LANGUAGE.—French or German, Luquien's French Prose of Popular Science; Hodges' Scientific German (4).
CHEMISTRY.—Lectures on the Non-Metals and Harris' Lecture Notes on General Chemistry (5).
HISTORY.—Fisher's Outlines—Mediaeval (3).
Practicums (8).—Chemistry (4), Dissection (4).

WINTER SESSION.

BIOLOGY.—General, Parker's Elementary Biology (3).
LANGUAGE.—French or German, Super's Historical Readings; Gore's German Science Reader (2).
CHEMISTRY.—Lectures on the Metals and Harris' Manual of Qualitative Analysis (3).
HISTORY.—Fisher's Outlines—Modern (4).
Practicums (10).—Chemistry (8), Biology (2).

SPRING SESSION.

GENERAL BIOLOGY.—Parker's Elementary Biology (4).
LANGUAGE.—French or German, Chateaubriand's Atala; Rene and Le Dernier Abeucerage; Kellar's Dietegen and Freytag's Soll und Haben (4).
CHEMISTRY.—The same as winter session (3).
Practicums (16).—Chemistry (12), Biology (4).

Junior Year.

FALL SESSION.

BIOLOGY.—Bastin's College Botany (4); Gray's Anatomy (5).
PHYSICS.—Mechanics, Lodge; and Electricity, Poyser (4).
Practicums (14).—Physical Measurements (4), Botany (6), Human Anatomy, (4).

WINTER SESSION.

BIOLOGY.—Botany, Bastin and Lectures (4); Histology, Shafer (5); Advanced Physiology, Martin (2).
PHYSICS.—Sound, Stone; Light, Lectures and Deschanel (4).
Practicums (10).—Physical Laboratory (4), Botany (6).

SPRING SESSION.

BIOLOGY.—Phenogamic Botany (4); Zoology, Lectures (4); Physiology, Martin, Advanced Course (3).
PHYSICS.—Heat, Garnett (4).
Practicums (10).—Physical Laboratory (4), Mineralogy (4), Physiology (2).

Senior Year.

FALL SESSION

BIOLOGY.—Zoology, Lectures (4).
GEOLOGY.—Dana (4).
PSYCHOLOGY.—Hoffding's Outlines (3).
ECONOMICS.—Walker's Political Economy (4).
Practicums (10).—Zoology (4), Geology (6).

WINTER SESSION.

BIOLOGY.—Theory of Evolution, Conn (3), Embryology, Foster and Balfour (3), Plant Physiology, Lectures (2).
GEOLOGY.—Dana (3).
POLITICAL SCIENCE.—Cooley's General Principles of Constitutional Law (4).
Practicums (10).—Zoology (4), Embryology (6).

SPRING SESSION.

BIOLOGY.—Advanced Problems, Lectures (5), Forestry, Lectures (3), Anthropology, Lectures (2).
POLITICAL SCIENCE.—Woolsey's International Law (5).
Practicums (10).—Graduation Thesis.

COURSE IN CHEMISTRY.

[The studies of the first two years in this Course are the same as in the General Science or the Latin-Scientific Course.]

Junior Year.

FALL SESSION.—Theoretical Chemistry, Remsen's (3), Quantitative Analysis (1), Physics, Mechanics, Lodge; Electricity, Poyser (4), Integral Calculus, Taylor (2).
Practicums.—Chemistry; Organic Preparations continued and Organic Analysis, including metric and Volumetric (16.
WINTER SESSION.—Theoretical Chemistry, Remsen's, and Organic Chemistry, Lectures (3), Quantitative Analysis (1), Physics, Sound, Stone; and Light, Lectures and Deschanel (4).
Practicums.—Physics (4), Chemistry, Quantitative Separations and Complete Analysis of **Alloys, Minerals and** Commercial Products (20).
SPRING SESSION.—Organic Chemistry, Lectures (3), Physics, Heat, Garnett (4), French or German (1), Ethics, Browne's (5).
Practicums.—Chemistry, Work of winter session continued (8), Mineralogy (6).

Senior Year

FALL SESSION.—Chemistry, Special Topics, Lectures, (4), Geology, Dana (4), Political Economy, Walker (4).
Practicums.—Chemistry; Analysis of Iron and Steel and Organic Preparations (16).
WINTER SESSION.—Chemical Technology, Wagner (3), Constitutional Law, Cooley's General Principles (4).
Practicums.—Phycical Measurements (4), Chemistry, Quantitative Determinations, Gravi-Analysis of Water, Urinary Analysis and Toxicology (26).
SPRING SESSION.—Chemical Technology, Wagner (3), International Law, Woolsey (5).
Practicum.—Chemistry: Ultimate Analysis and Sanitary Chemistry (24), Graduation Thesis.